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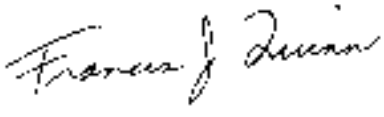
The articles in *SCMR* come from thought leaders in the academic, analyst and management consulting communities. Perhaps most importantly, they also include contributions from supply chain practitioners themselves—the individuals who are literally transforming their organizations.

As a "thank you" for your subscription we have assembled some of the top articles in recent years from *SCMR*. What follows is a compilation of ten "classics" that cover a range of critical supply chain topics. They include:

We hope that you find these articles informative and enjoyable!



Francis J. Quinn
Editorial Director

SUPPLY CHAIN MANAGEMENT REVIEW

Editorial Offices
111 Speen St. (Suite 200), Framingham, MA 01701-2000, 1-800- 375-8015

Francis J. Quinn
Editorial Director
fquinn@ehpub.com

Mike Roach
Creative Director
mroach@ehpub.com

Wendy DelCampo
Art Director
wdelcampo@ehpub.com

John Kerr
Special Projects Editor
johnkerr@ergoeditorial.biz

Jeff Berman
Online News Editor
jberman@ehpub.com

Kelly Jones
Production Manager
kjones@ehpub.com

Subscriber services
scmrsubs@ehpub.com

Brian Ceraolo
Group Publisher
bceraolo@ehpub.com

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The Best of *Supply Chain Management Review*

The 7 Principles of Supply Chain Management

David L. Anderson, Frank F. Britt, and Donavon J. Favre

When this article was published, David L. Anderson and Donavon J. Favre were consultants in Andersen Consulting's Strategic Services Logistics Practice. Frank F. Britt, an alumnus of that practice, was Vice President of Marketing and Merchandising at Streamline Inc.

The most requested article in the 10-year history of *Supply Chain Management Review* was one that appeared in our very first issue in the spring of 1997. Written by experts from the respected Logistics practice of Andersen Consulting (now Accenture), "The Seven Principles of Supply Chain Management," layed out a clear and compelling case for excellence in supply chain management. The insights provided here remain remarkably fresh ten years later.

Managers increasingly find themselves assigned the role of the rope in a very real tug of war—pulled one way by customers' mounting demands and the opposite way by the company's need for growth and profitability. Many have discovered that they can keep the rope from snapping and, in fact, achieve profitable growth by treating supply chain management as a strategic variable.

These savvy managers recognize two important things. First, they think about the supply chain as a whole—all the links involved in managing the flow of products, services, and information from their suppliers' suppliers to their customers' customers (that is, channel customers, such as distributors and retailers). Second, they pursue tangible outcomes—focused on revenue growth, asset utilization, and cost.

Rejecting the traditional view of a company and its component parts as distinct functional entities, these managers realize that the real measure of success is how well activities coordinate across the supply chain to create value for customers, while increasing the profitability of every link in the chain.

Our analysis of initiatives to improve supply chain management by more than 100 manufacturers, distributors, and retailers shows many making great progress, while others fail dismally. The successful initiatives that have contributed to profitable growth share several themes. They are typically broad efforts, combining both strategic and tactical change. They also reflect a holistic approach, viewing the supply chain from end to end and orchestrating efforts so that the whole improvement achieved—in revenue, costs, and asset utilization—is greater than the sum of its parts.

Unsuccessful efforts likewise have a consistent profile. They tend to be functionally defined and narrowly focused, and they lack sustaining infrastructure. Uncoordinated change activity erupts in every department and function and puts the company in grave danger of "dying the death of a thousand initiatives." The source of failure is seldom management's difficulty identifying what needs fixing. The issue is determining how to develop and execute a supply chain transformation plan that can move multiple, complex operating entities (both internal and external) in the same direction.

To help managers decide how to proceed, we revisited the supply chain initiatives undertaken by the most successful manufacturers and distilled from their experience seven fundamental principles of supply chain management.

Principle 1: Segment customers based on the service needs of distinct groups and adapt the supply chain to serve these segments profitably.

Segmentation has traditionally grouped customers by industry, product, or trade channel and then taken a one-size-fits-all approach to serving them, averaging costs and profitability within and across segments. The typical result, as one manager admits: "We don't fully understand the relative value customers place on our service offerings."

But segmenting customers by their particular needs equips a company to develop a portfolio of services tailored to various segments. Surveys, interviews, and industry research have been the traditional tools for defining key segmentation criteria.

Viewed from the classic perspective, this needs-based segmentation may produce some odd couples. For the manufacturer in Exhibit 1, "innovators" include an industrial distributor (Grainger), a do-it-yourself retailer (Home Depot), and a mass merchant (Wal-Mart).

Research also can establish the services valued by all customers versus those valued only by certain segments. Then the company should apply a disciplined, cross-functional process to develop a menu of supply chain programs and create segment-specific service packages that combine basic services for everyone with the services from the menu that will have the greatest appeal to particular segments. This does not mean tailoring for the sake of tailoring. The goal is to find the degree of segmentation and variation needed to maximize profitability.

All the segments in Exhibit 1, for example, value consistent delivery. But those in the lower left quadrant have little interest in the advanced supply chain management programs, such as customized packaging and advance shipment notification, that appeal greatly to those in the upper right quadrant.

Of course, customer needs and preferences do not tell the whole story. The service packages must turn a profit, and many companies lack adequate financial understanding of their customers' and their own costs to gauge likely profitability. "We don't know which customers are most profitable to serve, which will generate the highest long-term profitability, or which we are most likely to retain," confessed a leading industrial manufacturer. This knowledge is essential to correctly matching accounts with service packages—which translates into revenues enhanced through some combination of increases in volume and/or price.

Only by understanding their costs at the activity level and using that understanding to strengthen fiscal control can companies profitably deliver value to customers. One "successful" food manufacturer aggressively marketed vendor-managed inventory to all customer segments and boosted sales. But subsequent activity-based cost analysis found that one segment actually lost nine cents a case on an operating margin basis.

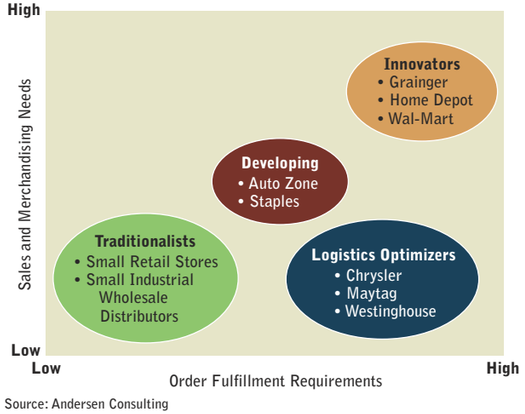
Most companies have a significant untapped opportunity to better align their investment in a particular customer relationship with the return that customer generates. To do so, companies must analyze the profitability of segments, plus the costs and benefits of alternate service packages, to ensure a reasonable return on their investment and the most profitable allocation of resources. To strike and sustain the appropriate balance between service and profitability, most companies will need to set priorities—sequencing the rollout of tailored programs to capitalize on existing capabilities and maximize customer impact.

Principle 2: Customize the logistics network to the service requirements and profitability of customer segments.

Companies have traditionally taken a monolithic approach to logistics network design in organizing their inventory, warehouse, and transportation activities to meet a single standard. For some, the logistics network has been designed to meet the average service requirements of all customers; for others, to satisfy the toughest requirements of a single customer segment.

EXHIBIT 1

Needs-Based Segmentation



Source: Andersen Consulting

Neither approach can achieve superior asset utilization or accommodate the segment-specific logistics necessary for excellent supply chain management. In many industries, especially such commodity industries as fine paper, tailoring distribution assets to meet individual logistics requirements is a greater source of differentiation for a manufacturer than the actual products, which are largely undifferentiated.

One paper company found radically different customer service demands in two key segments—large publishers with long lead times and small regional printers needing delivery within 24 hours. To serve both segments well and achieve profitable growth, the manufacturer designed a multi-level logistics network with three full-stocking distribution centers and 46 quick-response cross-docks, stocking only fast-moving items, located near the regional printers.

Return on assets and revenues improved substantially thanks to the new inventory deployment strategy, supported by outsourcing of management of the quick response centers and the transportation activities.

This example highlights several key characteristics of segment-specific services. The logistics network probably will be more complex, involving alliances with third-party logistics providers, and will certainly have to be more flexible than the traditional network. As a result, fundamental changes in the mission, number, location, and ownership structure of warehouses are typically necessary. Finally, the network will require more robust logistics planning enabled by "real-time" decision-support tools that can handle flow-through distribution and more time-sensitive approaches to managing transportation.

Principle 3: Listen to market signals and align demand planning accordingly across the supply chain, ensuring consistent forecasts and optimal resource allocation.

Forecasting has historically proceeded silo by silo, with multiple departments independently creating forecasts for the same products—all using their own assumptions, measures, and level of detail. Many consult the marketplace only informally, and few involve their major suppliers in the process. The functional orientation of many companies has just made things worse, allowing sales forecasts to envision growing demand while manufacturing second-guesses how much product the market actually wants.

Such independent, self-centered forecasting is incompatible with excellent supply chain management, as one manufacturer of photographic imaging found. This manufacturer nicknamed the warehouse "the accordion" because it had to cope with a production operation that stuck to a stable schedule, while the revenue-focused sales force routinely triggered cyclical demand by offering deep discounts at the end of each quarter. The manufacturer realized the need to implement a cross-functional planning process, supported by demand planning software.

Initial results were dismaying. Sales volume dropped sharply, as excess inventory had to be consumed by the marketplace. But today, the company enjoys lower inventory and warehousing costs and much greater ability to maintain price levels and limit discounting. Like all the best sales and operations planning (S&OP), this process recognizes the needs and objectives of each functional group but bases final operational decisions on overall profit potential.

Excellent supply chain management, in fact, calls for S&OP that transcends company boundaries to involve every link of the supply chain (from the supplier's supplier to the customer's customer) in developing forecasts collaboratively and then maintaining the required capacity across the operations. Channel-wide S&OP can detect early warning signals of demand lurking in customer promotions, ordering patterns, and restocking algorithms and takes into account vendor and carrier capabilities, capacity, and constraints.

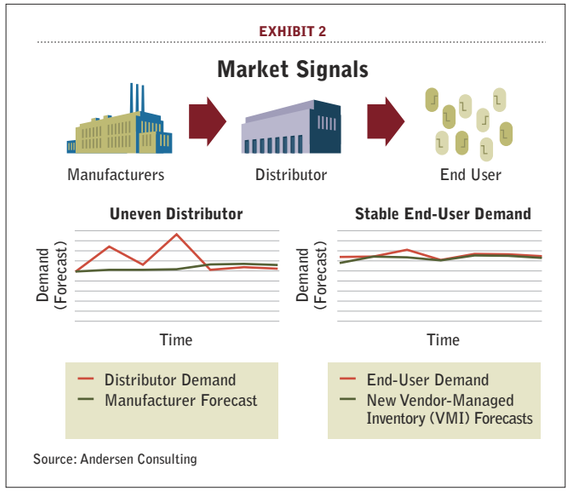
Exhibit 2 illustrates the difference that cross supply chain planning has made for one manufacturer of laboratory products. As shown on the left of this exhibit, uneven distributor demand unsynchronized with actual end-user demand made real inventory needs impossible to predict and forced high inventory levels that still failed to prevent out-of-stocks. Distributors began sharing information on actual (and fairly stable) end-user demand with the manufacturer, and the manufacturer began managing inventory for the distributors. This coordination of manufacturing scheduling and inventory deployment decisions paid off handsomely, improving fill rates, asset turns, and cost metrics for all concerned.

Principle 4: Differentiate product closer to the customer and speed conversion across the supply chain.

Manufacturers have traditionally based production goals on projections of the demand for finished goods and have stockpiled inventory to offset forecasting errors. These manufacturers tend to view lead times in the system as fixed, with only a finite window of time in which to convert materials into products that meet customer requirements.

EXHIBIT 2

Market Signals



Source: Andersen Consulting

While even such traditionalists can make progress in cutting costs through set-up reduction, cellular manufacturing, and just-in-time techniques, great potential remains in less traditional strategies such as mass customization. For example, manufacturers striving to meet individual customer needs efficiently through strategies such as mass customization are discovering the value of postponement. They are delaying product differentiation to the last possible moment and thus overcoming the problem described by one manager of a health and beauty care products warehouse: "With the proliferation of packaging requirements from major retailers, our number of SKUs (stock keeping units) has exploded. We have situations daily where we backorder one retailer, like Wal-Mart, on an item that is identical to an in-stock item, except for its packaging. Sometimes we even tear boxes apart and repackage by hand!"

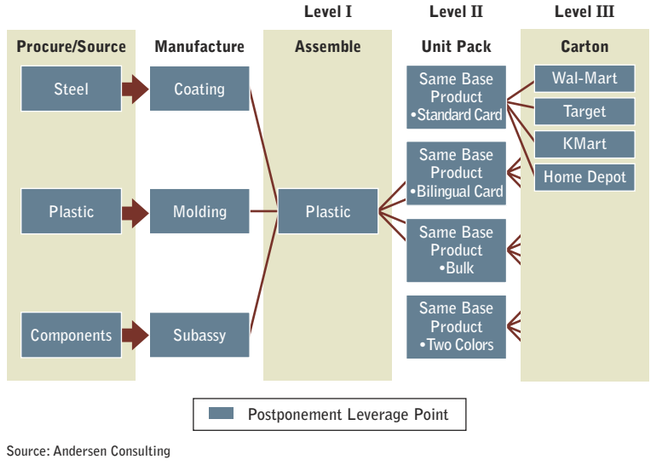
The hardware manufacturer in Exhibit 3 solved this problem by determining the point at which a standard bracket turned into multiple SKUs. This point came when the bracket had to be packaged 16 ways to meet particular customer requirements. The manufacturer further concluded that overall demand for these brackets is relatively stable and easy to forecast, while demand for the 16 SKUs is much more volatile. The solution: make brackets in the factory but package them at the distribution center, within the customer order cycle. This strategy improved asset utilization by cutting inventory levels by more than 50 percent.

Realizing that time really is money, many manufacturers are questioning the conventional wisdom that lead times in the supply chain are fixed. They are strengthening their ability to react to market signals by compressing lead times along the supply chain, speeding the conversion from raw materials to finished products tailored to customer requirements. This approach enhances their flexibility to make product configuration decisions much closer to the moment demand occurs.

The key to just-in-time product differentiation is to locate the leverage point in the manufacturing process where the product is unalterably configured to meet a single requirement and to assess options, such a postponement, modularized design, or modification of manufacturing processes, that can increase flexibility. In addition, manufacturers must challenge cycle times: Can the leverage point be pushed closer to actual demand to maximize the manufacturer's flexibility in responding to emerging customer demand?

EXHIBIT 3

Packaging Postponement



Source: Andersen Consulting

Principle 5: Manage sources of supply strategically to reduce the total cost of owning materials and services.

Determined to pay as low a price as possible for materials, manufacturers have not traditionally cultivated warm relationships with suppliers. In the words of one general manager: "The best approach to supply is to have as many players as possible fighting for their piece of the pie—that's when you get the best pricing."

Excellent supply chain management requires a more enlightened mindset—recognizing, as a more progressive manufacturer did: "Our supplier's costs are in effect our costs. If we force our supplier to provide 90 days of consigned material when 30 days are sufficient, the cost of that inventory will find its way back into the supplier's price to us since it increases his cost structure." While manufacturers should place high demands on suppliers, they should also realize that partners must share the goal of reducing costs across the supply chain in order to lower prices in the marketplace and enhance margins. The logical extension of this thinking is gain-sharing arrangements to reward everyone who contributes to the greater profitability.

Some companies are not yet ready for such progressive thinking because they lack the fundamental prerequisite. That is, a sound knowledge of all their commodity costs, not only for direct materials but also for maintenance, repair, and operating supplies, plus the dollars spent on utilities, travel, temps, and virtually everything else. This fact-based knowledge is the essential foundation for determining the best way of acquiring every kind of material and service the company buys.

With their marketplace position and industry structure in mind, manufacturers can then consider how to approach suppliers—soliciting short-term competitive bids, entering into long-term contracts and strategic supplier relationships, outsourcing, or integrating vertically. Excellent supply chain management calls for creativity and flexibility.

Principle 6: Develop a supply chain-wide technology strategy that supports multiple levels of decision making and gives a clear view of the flow of products, services, and information.

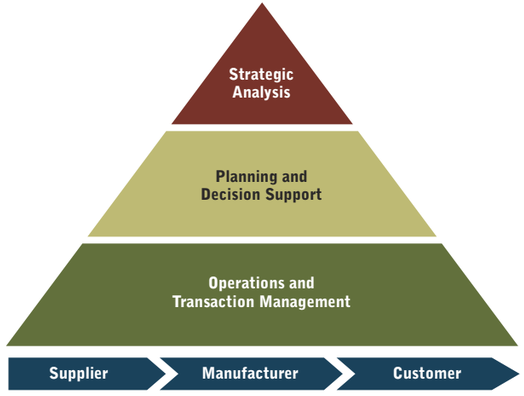
To sustain reengineered business processes (that at last abandon the functional orientation of the past), many progressive companies have been replacing inflexible, poorly integrated systems with enterprise-wide systems. Yet too many of these companies will find themselves victims of the powerful new transactional systems they put in place. Unfortunately, many leading-edge information systems can capture reams of data but cannot easily translate it into actionable intelligence that can enhance real-world operations. As one logistics manager with a brand-new system said: "I've got three feet of reports with every detail imaginable, but it doesn't tell me how to run my business."

This manager needs to build an information technology system that integrates capabilities of three essential kinds. (See Exhibit 4.) For the short term, the system must be able to handle day-to-day transactions and electronic commerce across the supply chain and thus help align supply and demand by sharing information on orders and daily scheduling. From a mid-term perspective, the system must facilitate planning and decision making, supporting the demand and shipment planning and master production scheduling needed to allocate resources efficiently. To add long-term value, the system must enable strategic analysis by providing tools, such as an integrated network model, that synthesize data for use in high-level "what-if" scenario planning to help managers evaluate plants, distribution centers, suppliers, and third-party service alternatives.

Despite making huge investments in technology, few companies are acquiring this full complement of capabilities. Today's enterprisewide systems remain enterprise-bound, unable to share across the supply chain the information that channel partners must have to achieve mutual success.

EXHIBIT 4

Key Aspects of Supply Chain Technology Strategy



Source: Andersen Consulting

Ironically, the information that most companies require most urgently to enhance supply chain management resides outside of their own systems, and few companies are adequately connected to obtain the necessary information. Electronic connectivity creates opportunities to change the supply chain fundamentally—from slashing transaction costs through electronic handling of orders, invoices, and payments to shrinking inventories through vendor-managed inventory programs.

Principle 7: Adopt channel-spanning performance measures to gauge collective success in reaching the end-user effectively and efficiently.

To answer the question, "How are we doing?" most companies look inward and apply any number of functionally oriented measures. But excellent supply chain managers take a broader view, adopting measures that apply to every link in the supply chain and include both service and financial metrics.

First, they measure service in terms of the perfect order—the order that arrives when promised, complete, priced and billed correctly, and undamaged. The perfect order not only spans the supply chain, as a progressive performance measurement should, but also view performance from the proper perspective, that of the customer.

Second, excellent supply chain managers determine their true profitability of service by identifying the actual costs and revenues of the activities required to serve an account, especially a key account. For many, this amounts to a revelation, since traditional cost measures rely on corporate accounting systems that allocate overhead evenly across accounts. Such measures do not differentiate, for example, an account that requires a multi-functional account team, small daily shipments, or special packaging. Traditional accounting tends to mask the real costs of the supply chain—focusing on cost type rather than the cost of activities and ignoring the degree of control anyone has (or lacks) over the cost drivers.

Deriving maximum benefit from activity-based costing requires sophisticated information technology, specifically a data warehouse. Because the general ledger organizes data according to a chart of accounts, it obscures the information needed for activity-based costing. By maintaining data in discrete units, the warehouse provides ready access to this information.

To facilitate channel-spanning performance measurement, many companies are developing common report cards. These report cards help keep partners working toward the same goals by building deep understanding of what each company brings to the partnership and showing how to leverage their complementary assets and skills to the alliance's greatest advantage. The willingness to ignore traditional company boundaries in pursuit of such synergies often marks the first step toward a "pay-for-performance" environment.

Translating Principles into Practice

Companies that have achieved excellence in supply chain management tend to approach implementation of the guid-

ing principles with three precepts in mind:

Orchestrate improvement efforts

The complexity of the supply chain can make it difficult to envision the whole, from end to end. But successful supply chain managers realize the need to invest time and effort up front in developing this total perspective and using it to inform a blueprint for change that maps linkages among initiatives and a well-thought-out implementation sequence. This blueprint also must coordinate the change initiatives with ongoing day-to-day operations and must cross company boundaries.

The blueprint requires rigorous assessment of the entire supply chain—from supplier relationships to internal operations to the marketplace, including customers, competitors, and the industry as a whole. Current practices must be ruthlessly weighed against best practices to determine the size of the gap to close. Thorough cost/benefit analysis lays the essential foundation for prioritizing and sequencing initiatives, establishing capital and people requirements, and getting a complete financial picture of the company's supply chain—before, during, and after implementation.

A critical step in the process is setting explicit outcome targets for revenue growth, asset utilization, and cost reduction. (See Exhibit 5.) While traditional goals for costs and assets, especially goals for working capital, remain essential to success, revenue growth targets may ultimately be even more important. Initiatives intended only to cut costs and improve asset utilization have limited success structuring sustainable win-win relationships among trading partners. Emphasizing revenue growth can significantly increase the odds that a supply chain strategy will create, rather than destroy, value.

EXHIBIT 5

Relationship Between Supply Chain Principles and Financial Outcomes

Seven Principles	Revenue Growth	Asset Utilization	Cost Reduction
1. Segment Customer Based on Needs	●	◑	◔
2. Customize Logistics Network	◑	●	◔
3. Listen to Market Signals And Plan Accordingly	○	●	◑
4. Differentiate Products Closer to Customers	○	◑	●
5. Source Strategically	○	◑	●
6. Develop Supply Chain Technology Strategy*	◑	●	◑
7. Adopt Channel-Spanning Measures	●	●	●

● High ◑ Medium ○ Low

* Information technology provides the infrastructure required to capture benefits across the supply chain

Source: Andersen Consulting

Remember that Rome wasn't built in a day

As this list of tasks may suggest, significant enhancement of supply chain management is a massive undertaking with profound financial impact on both the balance sheet and the income statement. Because this effort will not pay off overnight, management must carefully balance its long-term promise against more immediate business needs.

Advance planning is again key. Before designing specific initiatives, successful companies typically develop a plan that specifies funding, leadership, and expected financial results. This plan helps to forestall conflicts over priorities and keeps management focused and committed to realizing the benefits.

Recognize the difficulty of change

Most corporate change programs do a much better job of designing new operating processes and technology tools than of fostering appropriate attitudes and behaviors in the people who are essential to making the change program work. People resist change, especially in companies with a history of "change-of-the-month" programs. People in any organization have trouble coping with the uncertainty of change, especially the real possibility that their skills will not fit the new environment.

Implementing the seven principles of supply chain management will mean significant change for most companies. The best prescription for ensuring success and minimizing resistance is extensive, visible participation and communication by senior executives. This means championing the cause and removing the managerial obstacles that typically present the greatest barriers to success, while linking change with overall business strategy.

Many progressive companies have realized that the traditionally fragmented responsibility for managing supply chain activities will no longer do. Some have even elevated supply chain management to a strategic position and established a senior executive position such as vice president-supply chain (or the equivalent) reporting directly to the COO or CEO. This role ignores traditional product, functional, and geographic boundaries that can interfere with delivering to customers what they want, when and where they want it.

Reaping the Rewards

The companies mentioned in this article are just a few of the many that have enhanced both customer satisfaction and profitability by strengthening management of the supply chain. While these companies have pursued various initiatives, all have realized the need to integrate activities across the supply chain. Doing so has improved asset utilization, reduced cost, and created price advantages that help attract and retain customers—and thus enhance revenue.

Supply Management Transformation: A Leader's Guide

By Robert A. Rudzki

Robert A. Rudzki, a former corporate SVP and Chief Procurement Officer, has led successful transformations at Fortune 500 companies. In 2004, he formed the management consulting firm Greybeard Advisors LLC (www.GreybeardAdvisors.com). Rudzki's books include Beat the Odds *and* Straight to the Bottom Line *(J. Ross Publishing). Read his blog, "Transformation Leadership," at www.scmr.com.*

Senior management may stay awake at night for any number of reasons. But what they may not realize is that many of the worries causing them sleep depravation can be alleviated by a solid supply management operation. But creating that kind of organization requires a transformation—from a reactive, transaction-oriented function to a strategic entity. Here is some practical advice on how to start making that transformation.

When presenting at a conference, one of my favorite questions to ask an audience is this: "Please raise your hand if you believe that most senior executives around the world understand the enormous potential of modern supply management." At best, 10 percent of the audience raises their hands.

The follow-up question takes the next logical step: "Keep your hands raised if you believe that those same executives understand how to achieve that enormous potential—how to build the transformation roadmap." Typically, no hands remain raised.

Is this an indictment of most senior executives? Or, is it an indictment of supply management leadership for failing to create executive awareness and develop the business case for what we can do? Or perhaps both?

This article addresses those tough questions. It offers real-world ideas on getting top management's attention to the real potential of supply management by highlighting the bottom-line implications. That's followed by the presentation of a set of guidelines, or "dimensions," for transforming supply management from a transaction-based reactive function to a powerful strategic force. Included in this discussion is practical advice on selecting the right organizational design to support the transformation effort.

Speaking the Language

Let's start with the observation that senior executives might stay awake at night for any number of work-related reasons. Based on my own experiences, the top sleep disrupters typically revolve around the following issues:

- Can the company meet or exceed earnings and performance expectations?
- Can we grow revenues and earnings year-over-year?
- Are we able to reduce risk and volatility in revenues and earnings?
- How can we continually improve return on invested capital (ROIC) or return on equity (ROE)?
- How can we create a unique business model, one that is difficult for competitors to copy?

Dave Cutler

The surprising fact is that successful supply management can favorably impact all five of these performance areas imbedded in these questions. As a corporate function, it is uniquely positioned—more so than most functions—to have a broad and sustainable impact on the business. The sad fact, though, is that most senior executives are unaware of this. A big reason for this lack of awareness is that no one has communicated the supply management opportunity in their language. Awareness doesn't just happen by itself. The central challenge for supply management professionals, then, is to take a leadership role in helping their senior management understand.

Toward this end, every CPO or chief supply chain officer needs to be conversant with the performance improvement framework shown in Exhibit 1. This is one of my favorite charts, and is the essence of relating supply management to improved corporate performance. Let's walk through this framework carefully.

Two important measures of corporate performance are return on invested capital (ROIC) and cash flow. ROIC is calculated by taking the annual earnings of a business and dividing it by the total capital invested in that business (long term debt and stockholder's equity). ROIC is important because it is an indicator of the current health of a business. For a business to create value to its shareholders, ROIC needs to exceed the corporate cost of capital.

Improving profits helps to improve both ROIC and cash

flow. Reducing the capital intensity of your business also helps to improve ROIC and cash flow. Improving profits while also reducing the capital needed to run the business has a powerful compounding effect on ROIC and cash flow.

Ok, so how do we go about improving profits? There are two fundamental ways: revenue enhancements and cost reductions. Supply management can—and should—play an important role in each of those areas, as indicated with examples shown in Exhibit 1. For example, supply management should take a leadership role in creating a more responsive supply chain, thereby helping the company to win more business (and increase revenues) from customers. Similarly, supply management can take the lead in applying good processes to better manage and lower costs across all areas of spend, not just those typically assigned to procurement.

So far so good, but how do we reduce capital intensity? Again, there are two ways: working capital improvements and capital expenditure improvements. Once again, supply management can play an important role in each of those areas. To cite one example, in many companies there is no clear responsibility for analyzing and coordinating supplier payment terms. This is an area ideally suited for supply management to lead. With regard to capital expenditures, experience demonstrates that the sooner supply management is involved in new projects (even at the concept stage), the better the overall project economics will be.

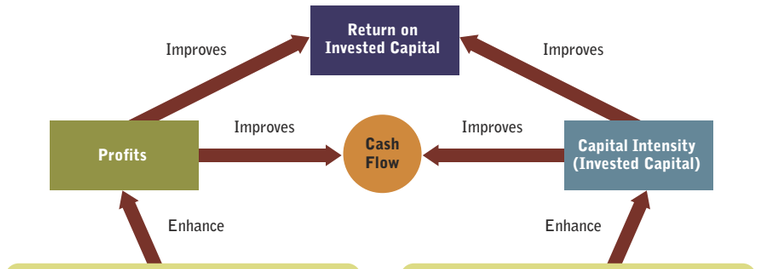
A thorough opportunity assessment for supply management requires a careful assessment of the improvement opportunities in each of the four categories shown on the exhibit. Then, to really tie it together for the executive audience, you need to relate those improvement opportunities to the company's income statement and balance sheet. Going that extra step allows you to demonstrate the impact of supply management on net income, on earnings per share, on ROIC and on cash flow—all key areas of interest for senior executives. It's a powerful way to communicate the enormous potential of modern supply management in the language of senior executives and in a manner relevant to your company. It's also critical for building a credible business case in support of a supply management transformation.

Each situation is unique. However, it's not unusual for a well-done opportunity assessment to demonstrate that a company's ROIC has the potential to double or triple from its pre-transformation levels. But then the next logical question is, "If that's correct, why aren't there a lot more 20 percent ROIC super-performers in the business world?"

The answer is painfully simple: achieving that step-change in performance doesn't just happen by itself. It takes leadership, and a well-designed and planned transformation roadmap.

EXHIBIT 1

World-Class Supply Management Drives Performance



Dimensions of a Successful Transformation

What do we mean by "supply management transformation"? Basically, it's the successful conversion or metamorphosis of supply management from a transaction-based, reactive function to a proactive, strategic driver of business performance—whose input is regularly sought by other areas of the company.

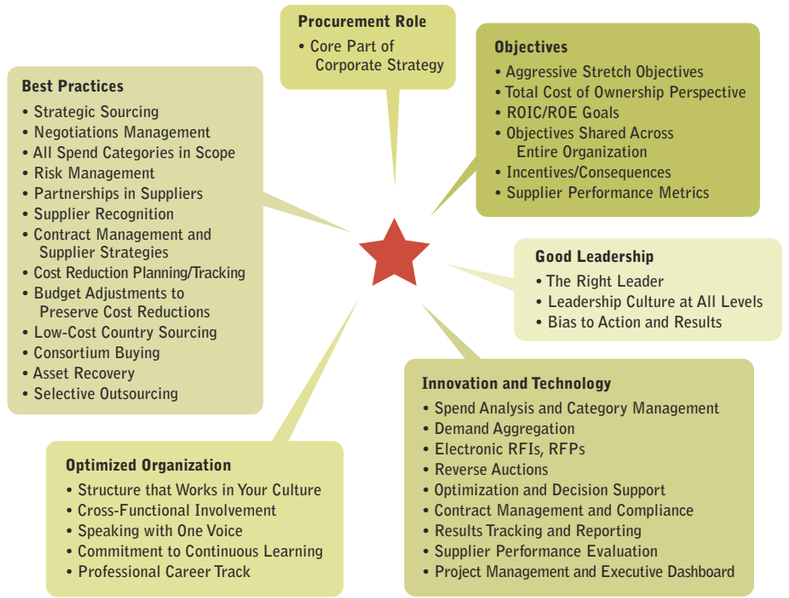
Companies that have successfully transformed their supply management operations into world-class performers have paid attention to six key dimensions of transformation.

As shown in Exhibit 2, those dimensions are procurement's role, objectives, leadership, organization, best practices, and innovation and technology. Underlying these six dimensions are more than 30 specific initiatives that ultimately comprise a comprehensive transformation plan.

For most companies, it's probably impractical to try to advance across all 30-plus initiatives from the very beginning of the transformation effort. You need a carefully thought-out roadmap that takes into account your current position (the so-called "as is" state) and establishes a logical sequence of initiatives that build on each other. From personal experience and my work in guiding clients, I can say with certainty that this task involves both art and science.

EXHIBIT 2

Six Dimensions of Successful Transformation



Source: Straight to the Bottom Line, J. Ross Publishing, 2005

You might wonder, Why not keep it simple and focus on just one initiative—say, strategic sourcing? Some companies have done that, focusing on that singular theme as their path to glory. Yet often, after an initial flurry of quick wins, those companies see their gains evaporate as the program falters. The reason: Such single-focus programs often lack the necessary pillars of support for a successful, sustainable transformation across those six dimensions described above.

Before you even start thinking about which initiatives to focus on, though, you need a strong leader in place to sponsor the transformation process. The logical place to look is the head of procurement or supply chain management. If that person is not comfortable in a leadership role, then you'll need to look elsewhere. It's a sad fact that not enough people are comfortable in leadership roles. (Lee Iacocca's new book, *Where Have All the Leaders Gone*, is a great read on this subject.)

Simply stated, the transformation leader has to be willing to advocate change—and put his or her neck on the line. Here's what I mean. First, he or she will need to develop a bold vision with stretch objectives that relate to the interests of senior management. And again, these objectives must be communicated in the language of the executive suite. The transformation leader must be willing to lay out a specific transformation plan and roadmap, with concrete milestones (achievements, not just activities).

Perhaps most important, the transformation leader must be willing to construct a business case that offers a performance commitment (that is, $X million of new cost reductions to the bottom line in each of the next few years) in exchange for the executive support (budget, people, and tools/systems) needed to make it happen. Without that show of confidence and commitment by the transformation leader, why would the rest of the executive team be willing to commit people and budget to the effort?

When I was a corporate CPO, I did exactly what I'm describing—and it made a huge difference. This approach helped to create the excitement and commitment within the organization needed to energize the transformation. Believe it or not, once you're willing to go down this path, once you are comfortable with the leadership imperative, the rest is easier than it might seem.

With regard to the other key dimensions, a critical element of success or potential failure relates to the role that supply management plays in the organization. Companies that make procurement and supply management a core part of their corporate strategy are more likely to produce great results. In my experience working with companies, I've observed that's it's much better to establish supply management in a strategic role if the comprehensive opportunity assessment has been conducted and a credible business case for transformation has bean made.

The next area of attention relates to the dimension of objectives. It's important to have stretch goals that are based on a total cost of ownership perspective, or ROIC goals. And it's critical that these objectives are shared across the entire organization. Stated another way, not sharing the supply management objectives with other key functions diminishes the chances that the transformation effort will succeed.

There are about a dozen key best practices, as noted in Exhibit 2. Note that strategic sourcing is just one of the practices that need to be understood and implemented with rigor.

Innovation and technology is a key enabler of the whole transformation initiative. The technology functions shown

in the exhibit can provide significant value to your activities. Perhaps most important, solutions available today are proven and well-integrated to ensure that the savings negotiated up front by procurement actually make it to the bottom line.

The Organization Chart Diversion

"We trained hard … but it seemed that every time we were beginning to form up into teams, we would be reorganized. I was to learn later in life that we tend to meet any new situation by reorganizing; and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency and demoralization."

— Petronius Arbiter, circa 210 BC

One dimension of the transformation effort, organization, demands special attention because of its potential to make or break the effort. Let's take a closer look, drawing on material from my book *Beat the Odds: Avoid Corporate Death and Build a Resilient Enterprise.*

Although a poor organization design can impede success, an organization design is rarely a driver of success.

To set the stage, consider the following scenario, which you may have actually experienced yourself. A company is experiencing overall performance problems that just don't seem to go away. The senior management team decides that the organization structure is at fault, and that a "corporate reorganization" will give the necessary boost to performance. In come the consultants and they draw up a whole new organization chart. New divisions are created on paper, management councils are designed, reporting relationships are changed, new job descriptions are re-written. Much time and money are spent on "correcting" things. Management breathes a sigh of relief, thinking that the performance problems are about to be solved.

Yet performance does not measurably improve. In fact, it worsens. Employees become disenchanted with senior management for not fixing things. They start losing their focus. (Keep in mind that quote from Petronius Arbiter.)

Although a poor organization design can impede success, an organization design is rarely a driver of success. Furthermore, the temptation to apply the "org chart fix" to an enterprise ignores an important reality: the informal relationships and networks inside an organization are often more important than hierarchical organization charts. Moreover, these informal ties are guided more by the organization's purpose, values, and vision than they are by the consultants' spiffy new org chart. This holds true whether we're talking about the overall corporate organization or the supply management function specifically.

The message in all of this: Before redrawing the supply management organization chart, it is much more productive to first address the role, objectives, leadership, and best practices. Build your transformation game plan for each of these critical dimensions before tackling the organization issue, and the specific enabling technology.

With the right role, objectives, leadership and best practices in place (or, at least, planned), you lay the foundation for success. You now can view organization design in terms of your corporate culture and what you want to achieve through supply management. Put another way, you can view organizational design in a strategic, transformation context.

Three Design Alternatives

But what is the ideal organization design for supply management? There is no single answer, contrary to what many hope and expect. Yet the options basically boil down to three: centralized, hybrid, and decentralized. (Exhibit 3 lists the advantages and issues associated with each approach.) Determining which one is right for your organization requires careful analysis and thought. What follows is a description of each option, which are detailed in a book I co-authored, *Straight to the Bottom Line*.

In general, a truly decentralized supply management organization has difficulty delivering world-class results in an efficient manner. Enterprise-wide leverage and coordination can be difficult in a decentralized environment. In addition, decentralization often means that resources are deployed across more locations than would otherwise be necessary.

That's the reality of decentralized supply management. Believe it or not, some companies may not care: I've talked with CPOs of several companies that are making a lot of money right now. Their executive teams aren't showing much interest in optimizing supply management performance through strategic consolidation of key activities. Eventually they will, of course, as business conditions change.

A fully centralized supply management organization can have some challenges, too, depending on internal corporate culture. But even if the overall corporate structure favors centralization, a centralized supply management function still must be responsive to the needs of the individual businesses. Being centralized is no excuse for being dogmatic or arbitrary (or sitting in an ivory tower). The satisfaction of your internal clients (your executives, business unit leaders, and other key internal stakeholders) is paramount—whatever structure is selected.

EXHIBIT 3

Main Organization Types

Centralized	Hybrid (Center-Led)	Decentralized
Description		
• Strong, unified professional procurement organization • Solid line reporting to head of procurement • Accountable to whole organization and to each business unit	• Small central staff develops policy, training coordination needs • Strategic procurement personnel serve entire organization • Dual reporting of local personnel to local management and to corporate head of procurement	• Separate procurement organizations • Dotted line reporting to corporate head of procurement, if there is one • Some degree of informal coordination and collaboration
Features		
• Rapid adoption of Best Practices, such as e-sourcing • Best for scale, leverage and results • Usually only possible with strong, highly respected CEO	• Can provide opportunity to build synergies across company while sensitive to each business unit • Politics can be brutal • Critical success factor: strong leadership and alignment of objectives	• Difficult to implement Best Practices • Less scale and leverage, weaker cost reduction results • More personnel required to accomplish objectives

Source: Straight to the Bottom Line, J. Ross Publishing, 2005

Hybrid structures are popular because they allow you to build and coordinate synergies across the company, while being sensitive to each business unit's unique needs. This is often accomplished by co-locating procurement personnel both at corporate headquarters and at the business operations. In many cases, these individuals have dual reporting responsibility to the local operations or finance head and to the corporate CPO.

Regardless of which option ultimately proves to be the best for your situation, consider applying these two proven techniques: creation of an executive steering committee and a procurement council. The steering committee is typically comprised of senior executives, representing corporate functions and business units. The committee provides high-level oversight and support of the organizational initiative. In the best of all worlds, members of the steering committee also act as sponsors of individual sourcing teams. Their involvement can send a powerful message of commitment both internally and to suppliers.

The procurement council typically is comprised of the CPO and representatives from the next level in the supply management organization. Structured properly, the council can be a valuable forum for driving change, sharing best practices, assuring alignment, and spurring results. As a CPO, I've witnessed procurement councils achieve these very goals, greatly advancing the overall transformation effort.

One last question should be asked with regard to organizational design: Should supply management report directly to the CEO? Direct reporting is really a two-edged sword. On the one hand, the CPO has direct access to the top executive in the organization. But on the other, this reporting relationship could result in a diminution of focus on the supply management ball.

Consider what happened to one friend and CPO peer who was made a direct report to the CEO. He started getting invited to lots of "staff meetings" unrelated to his job. Most of the discussion at those meetings, he felt, was a waste of his time and a distraction from his core responsibilities.

The key to supply management success is not the lines on the corporate organization chart. The real key is access. The CPO should have regular and easy access to the executive suite and to the heads of the business divisions.

Skin in the Game

One last ingredient in a successful supply management transformation is what I call "skin in the game." This refers to the importance of having the interests of key stakeholders and participants linked to the objectives of the transformation process. You might think of "skin in the game" as the mechanism to increase the likelihood that all the pieces—and all the players—work smoothly together.

Skin in the game can be manifested at different levels. As a minimum, it starts with incorporating objectives of the transformation plan into the annual, written performance objectives of relevant employees. By relevant employees, I mean everyone from the CEO to the entry-level buyer—from procurement professionals to internal clients. Anyone who

EXHIBIT 4

Advantages of a Supply Management Transformation

World-Class Procurement and Supply Management
• Potential of 2-10% Total Cost Reductions for Direct Spend • Potential of 10-40% Total Cost Reductions for Indirect Spend • Revenue Enhancements - Better Able to Compete for Sales with a More Responsive Supply Chain • Improved Cycle Time for New Product/Service Development • Working Capital Improvements • Improved market Knowledge, for Company-Wide Benefit • Better Risk Management, and Enhanced Business Planning • Improved ROIC/ROE and EPS

Source: Greybeard Advisors LLC

can influence the success of the transformation process should have some skin in the game.

The next level is the linking of those personal objectives to financial incentives and consequences—and making them meaningful. One company I've worked with takes this to the max by tying a signifi cant percentage of the annual bonus program to the success of the procurement transformation plan. The program sets annual milestones on key dimensions of the plan, including quantifi able cost reductions.

Meaningful incentives can be quite effective in encouraging superior performance and achieving objectives. But, what about the individual "blocker" who just won't participate or, worse, actively works against the transformation? I've encountered such troubling situations a few times as a CPO. When I discussed the particulars of one specifi c instance with a top executive at my company, someone whose advice I valued, his response was straightforward: "That's why we have flagpoles. Not just to rally the troops for a good cause but, if necessary, to hoist the recalcitrant party up in the air so everyone can see the example." Though a little harsh, his point was well-made.

The underlying message is that you need to address the problem quickly and publicly. A reluctance to deal with noncompliance is a big reason why transformation efforts get derailed. That's not to say that you go looking for people to serve up as examples. First, try to understand why the individual appears to be blocking the transformation effort. Have a conversation with him or her. Attempt to figure out what's driving the behavior. Make absolutely certain that the individual has all the necessary facts at his or her disposal. You may discover that their reluctance to comply is based on some fundamental misunderstanding or a perception that they're being left out.

In the final analysis, you don't want reluctant compliance. You want active commitment. And that really is the litmus test of supply management transformation. Genuine transformation produces significant, sustainable results both near-term and long-term. (Exhibit 4 lists some of those powerful advantages.) And it does so by creating an enormous amount of positive energy and commitment from all areas of an organization. Without that, you might be stuck with a few "quick wins" that eventually disappear—along with your credibility.

The GREENING *of* Wal-Mart's Supply Chain

By Erica L. Plambeck

Erica Plambeck(plambeck_erica@gsb.stanford.edu) is Associate Professor of Operations, Information and Technology in the Graduate School of Business and Senior Fellow in the Woods Institute for Environment at Stanford University.

In October 2005, Wal-Mart CEO Lee Scott committed the company to three ambitious goals: To be supplied 100 percent by renewable energy; to create zero waste; and to sell products that sustain Wal-Mart's resources and the environment. This is the story of Wal-Mart's progress toward those goals and the array of innovative practices that Wal-Mart is implementing to "green" its supply chain.

In October 2005, in an auditorium filled to capacity, Wal-Mart President and CEO Lee Scott made the company's first speech to be broadcast to 1.6 million employees in all 6,000-plus stores worldwide—and shared with its 60,000-plus suppliers. Scott announced that Wal-Mart was launching a sweeping business sustainability strategy to dramatically reduce the company's impact on the global environment and thus become "the most competitive and innovative company in the world." He argued that "being a good steward of the environment and being profitable are not mutually exclusive. They are one and the same." Scott also committed Wal-Mart to three aspirational goals: "To be supplied 100 percent by renewable energy; to create zero waste; and to sell products that sustain our resources and the environment."[1]

To meet those goals, Wal-Mart would seek to transform its supply chain, in cooperation with suppliers and environmental nonprofit organizations. Gwen Rutta, Director of Corporate Partnerships at Environmental Defense, was excited about working with Wal-Mart: "We've come to believe through experience that you really can create environmental progress by leveraging corporate purchasing power," she said. "And who's got more purchasing power than Wal-Mart?"[2]

Indeed, Lee Scott's cooperative business sustainability strategy would go much farther than the retail giant's earlier green initiatives. In the past, Wal-Mart had dealt with environmental issues defensively, rather than cooperatively, proactively, and as profit opportunities. In 1989, in response to letters from customers about environmental concerns, the company had launched a campaign to convince its suppliers to provide environmentally safe products in recyclable or biodegradable packaging. The large-scale effort met with some skepticism from commentators who believed that it was intended to generate benefits for Wal-Mart at its suppliers' expense.[3]

Stuart Briers

Nevertheless, the company did earn some "goodwill among environmentalists [as] the first major retailer to speak out in favor of the environment in 1989."[4] When vendors claimed they had made environmental improvements to products, Wal-Mart began promoting the products with green-colored shelf tags (without measuring or monitoring the improvements themselves). At one point, the company sold as many as 300 products with green tags. But not all the headlines were positive. One large supplier was exposed for stretching its claim to offer environmentally friendly paper towels, and Wal-Mart and the supplier were heavily criticized.[5] By the early 1990s, the green tag program disappeared altogether, and environmental issues seemed to slip off the company's list of strategic priorities.

Lee Scott, along with Andrew Ruben and Tyler Elm, vice president and senior director of corporate strategy and business sustainability, respectively, recognized that in contrast to those early campaigns, their new sustainability strategy would need to be deeply embedded in Wal-Mart's operations and supply chain management to meet the ambitious goals set in 2005. Elm put it this way: "We recognized early on that we had to look at the entire value chain. If we had focused on just our own operations, we would have limited ourselves to 10 percent of our effect on the environment and eliminated 90 percent of the opportunity that's out there."[6]

Looking Outside the "Bentonville Bubble"

In 2005, with that recognition in mind, Ruben hired Blu Skye Sustainability Consulting to help identify the categories of Wal-Mart's products and processes that had the greatest

environmental impact. The Wal-Mart/Blu Skye team multiplied sales data with environmental impact factors from the Union of Concerned Scientists,[7] and identified 14 focal areas, bundled into three broad categories: renewable energy; zero waste; and sustainable products. (See Exhibits 1 and 2). For each focal area, an executive sponsor (primarily at the executive vice president level) and a network captain (typically a senior vice president) took charge of building a sustainable value network of Wal-Mart employees and representatives from government, academia, environmental nonprofits, suppliers, and other stakeholders. The goal was to reduce environmental impacts and derive profit from that positive change. Network captains were typically senior managers from Sam's Club or Wal-Mart who were considered to be among the company's top performers. Whereas Wal-Mart had previously been notorious for being internally and operationally focused, the network captains were charged to look outside "the Bentonville Bubble" for strategic input and asked to start "pulling ideas from everywhere," even from critics.[8]

EXHIBIT 1

Wal-Mart's 14 Sustainable Value Networks

Renewable Energy	Global Greenhouse Gas Strategy Alternative Fuels Energy, Design Construction & Maintenance Global Logistics
Zero Waste	Operations & Internal Procurement Packaging
Sustainable Products	Textiles Electronics Food & Agriculture Forest & Paper Chemical Intensive Products Jewelry Seafood China

Source: Wal-Mart

Environmental groups joined the networks with some trepidation. As a *Financial Times* article put it, "For membership-based environmental groups, such as the Sierra Club, and others that seek to work in coalition with student and labor campaigners, engaging with the biggest villain on the block presents risks of losing support and funds."[9] However, many such organizations decided that the advantages of being able to help influence Wal-Mart's environmental performance outweighed any negative repercussions from the association. Seeking the opportunity to drive positive environmental change on a massive scale, nonprofits and nongovernmental organizations (NGOs) such as Environmental Defense stationed employees in the company's Bentonville, Ark. headquarters to work within the networks. However, Wal-Mart strategically decided *not* to hire associates—employees—to work on sustainability on a full-time basis, but instead to embed sustainability in their daily work. Elm explained the approach: "Business sustainability isn't something you're doing in addition to your job. It is a new way of approaching your job." To help make that lean model viable and because Wal-Mart lacked internal expertise in environmental sustainability, the company hired one or more external advisors from Blu Skye or Rocky Mountain Institute (RMI) for each network.

To capitalize on the incoming ferment of creative ideas, many of the 14 networks implemented new supply chain management practices. Across all 14 networks, the leaders intensified the company's efforts to move toward stronger relationships with a relatively small number of suppliers. With assistance from its network partners—the environmental nonprofits and consultants—Wal-Mart set a goal of motivating suppliers to "race to the top" in improving the environmental sustainability of products and processes. The new supply chain management practices associated with this initiative are summarized here, and described in greater detail below, with examples drawn from the company's global logistics, China, seafood, electronics, and textiles networks. Wal-Mart is engaging its array of network partners to:

1. Design goals and metrics for monitoring the environmental performance of suppliers' products and processes, and identify breakthrough product and process technologies.
2. Certify suppliers and oversee the chain of custody for eco-labeled products.
3. Assist suppliers with process innovation — especially the lower-tier suppliers that were previously less visible to Wal-Mart.

Wal-Mart also is implementing the following cooperative supply chain management practices to motivate suppliers to reduce the environmental impacts of their products and processes:

EXHIBIT 2

Wal-Mart's Sustainable Value Network Structure

Source: Wal-Mart

4. Commit to buy a specified quantity of an innovative product.
5. Eliminate intermediaries and brokers in the supply chain.
6. Consolidate business with a select group of direct suppliers and develop longer-term strategic relationships with each of those suppliers.
7. Redesign the buying organization to give one person responsibility for nurturing the relationship with each direct supplier and for handling negotiations with that supplier on pricing, quality, and environmental innovation.
8. Encourage licensing of environmental innovations.

Each of these numbered points is illustrated below with examples from the various networks.

1. Identifying Goals, Metrics, and New Technologies

Speaking to the task of identifying efficient new technologies and goal-setting, sustainability director Elm said: "The value of the network approach is that the goals grew as the spirit of the possible grew. [For example,] the involvement of groups like Rocky Mountain Institute in our logistics program had a tremendous impact on how much and how quickly Wal-Mart recognized it could drive change. Initially, the logistics network was going after incremental gains—for example, improving the efficiency of Wal-Mart's trucking fleet by a few percent over several years. But now they plan to double its efficiency in 10 years." With guidance from RMI, Wal-Mart started to procure hybrid diesel-electric trucks and refrigerated trucks that featured a small power unit for cooling so the engine could be turned off when the truck was stopped. In the first year of the program following Lee Scott's announcement, the logistics network achieved roughly a 25 percent improvement in fuel efficiency, meaning almost $75 million in annual savings and 400,000 tons of CO_2 per year that did not enter the atmosphere.

Wal-Mart strategically decided not to hire associates— employees—to work on sustainability on a full-time basis, but instead to embed sustainability in their daily work.

For its part, the packaging network implemented a Web-based scorecard that would evaluate each product's packaging against nine sustainability metrics, including cube utilization, recycled content, CO_2 per ton of production, and recovery value. The scorecard was developed with input from the 200-plus members of the packaging network, including nonprofits, the U.S. Environmental Protection Agency, Wal-Mart's direct suppliers, packaging suppliers, and other stakeholders. Wal-Mart's more than 60,000 suppliers were asked to use the scorecard throughout calendar 2007 to see how their packaging innovations, environmental standards, energy efficiencies, and use of materials rated relative to their peers. Beginning in 2008, Wal-Mart formally planned to use the system to "measure and recognize its entire supply chain based upon each company's ability to use less packaging, utilize more effective materials in packaging, and source these materials more efficiently relative to other suppliers."[10] The scorecard is an important enabler for Wal-Mart to achieve its public goal of reducing the packaging used by all of its suppliers by 5 percent between 2008 and 2013. If achieved, this five-year program is expected to generate $3.4 billion in savings. In the first month, 2,268 vendors have logged onto the packaging scorecard site and 117 products have been entered into the system.

2. Certifying Environmentally Sustainable Products

According to an international study released in 2006, all species of wild seafood are greatly depleted and predicted to collapse within 50 years.[11] Within this ominous business environment, Wal-Mart sourced approximately $750 million in seafood in 2006, and the company's volume of seafood business is growing at roughly 25 percent a year. "I am already having a hard time getting supply," said Peter Redmond, vice president for seafood and deli, and captain of the Wal-Mart seafood network. "If we add 250 stores a year, imagine how hard it will be in five years." Redmond believes that continuity of supply is the greatest challenge for Wal-Mart's seafood network, and sees the Marine Stewardship Council's certification program for wild-caught fish as the best means for addressing this challenge.

The Marine Stewardship Council (MSC), established by Unilever and the World Wildlife Fund (WWF) in 1997, has defined standards for certification as a sustainable fishery, based on the United Nations' Code of Conduct for Responsible Fishing and on input from fishermen, retailers, government, nonprofits, and other stakeholders. The MSC certifies third parties to audit and certify fishery and processor compliance throughout the supply chain, from "boat to plate."[12] An MSC eco-label on the finished product signals to consumers that the fish has been harvested and processed in a sustainable manner. By raising consumer awareness, the MSC hopes to drive demand and thus motivate the industry to shift to more sustainable fishing practices.[13]

In its textiles network, Wal-Mart is partnering with environmental nonprofits to select standards for organic cotton farming and manufacturing processes and relying on those partners to oversee the chain of custody. Kim Brandner,

senior brand manager of sustainable textiles for Wal-Mart, described Wal-Mart's approach:

> *We've worked with the Organic Trade Association and the Organic Exchange (OE) to make sure that we are upholding the most stringent guidelines and standards. For the growth of cotton, we have chosen the U.S. Department of Agriculture (USDA) standards. So, regardless of where the cotton is grown around the world, the farmers have to follow USDA guidelines for organic growth. For processing, we're following the Global Organic Textile Standard.*

Third-party organizations certify practices at each link in the supply chain as the cotton moves from farm to factory. "There are about 150 certification agencies, but we recognize only the seven that we think are the most strict… Since we're not doing that paperwork, our reputation is resting on who is certifying for us, which is why we picked the toughest certification companies," said Brandner. Certification paperwork is completed at each step in the process and finally reviewed by Consumer Testing Laboratories (CTL) in conjunction with final product testing. Currently, the cost and labor requirements of certification are largely absorbed by Wal-Mart's suppliers.

3. Providing Network Partner Assistance to Suppliers

Wal-Mart is able to provide suppliers with valuable knowledge and process assistance through its strong relationships with the environmental nonprofits in its networks. For example, when the Chinese government threatened to shut down a number of textile dye houses, including one of Wal-Mart's suppliers, in order to reduce pollution in Beijing ahead of the 2008 Olympics, Wal-Mart immediately took action. Brandner explains, "[We] put the dye house in touch with one of the NGOs in our network, which helped it formulate a more environmentally friendly process that reduced its toxic output very quickly. Although other retailers were negatively affected by the shutdown of their Chinese dye suppliers, we did not have any of our production capacity cut with this vendor."

In its textiles network, Wal-Mart is partnering with environmental nonprofits to select standards for organic cotton farming and manufacturing processes and relying on those partners to oversee the chain of custody.

In the seafood network, Wal-Mart is relying on the WWF to increase the number of fisheries and processing plants in the MSC certification program. Specifically, WWF helps boat operators and processors prepare to enter the certification process by doing a preliminary evaluation and identifying specific problems that need to be fixed (e.g. strengthening management practices, rebuilding stocks, and reducing environmental impacts before they will qualify for certification by the MSC).

Similarly, with the support of nonprofits such as OE, Wal-Mart is engaging more deeply in its textile supply chain than ever before. "It used to be that if Wal-Mart was buying Champion t-shirts, they wouldn't look past Sara Lee [which held the license for Champion products]. They didn't think about the spinner, or the dyer, the ginner, or the farmer," said Diana Rothschild, former Wal-Mart employee and Blu Skye consultant to the textiles network. Under the new strategy, Wal-Mart employees now interact directly with organic cotton farmers to understand their needs as OE helps them to improve farming practices.

Assistance from Wal-Mart's network partners is invaluable to suppliers and makes doing business with Wal-Mart more attractive. Suppliers have a strong incentive to innovate in order to keep Wal-Mart's business.

4. Committing to Larger Volumes of Environmentally Sustainable Products

By making a commitment to buy a specified quantity of each product certified as environmentally friendly, Wal-Mart gives its suppliers an incentive to develop and produce that product.

For instance, in its textiles network, the retailer learned that, along with the cost of certification, farmers faced a near-term reduction in yields with organic cotton farming, as well as the need to diversify crops. "Organic farmers can't grow cotton in the same field for an extended time because it depletes the soil of nutrients," said Rothschild. This forced farmers to alternate the planting of cotton with legumes, vegetables, or other cover crops to rejuvenate the soil.[14] "Those alternate crops often cannot be sold as organic and are not as lucrative as organic cotton. This creates the temptation for farmers to turn to non-organic farming," she explained. However, to meet organic standards, a farm needed to remain free of non-organic pesticides or similar materials for a period of three years prior to the harvest of any organic crop.[15] To increase and secure its supply of organic cotton, Wal-Mart made a five-year verbal commitment to buy organic cotton from farmers. "It gives them confidence and stability," said Lucy Cindric, captain of the textile network. In addition, to help reduce uncertainty in the market, Wal-Mart (which became the world's largest purchaser of organic cotton in 2006) also agreed to purchase the organic cotton farmers' alternate crops.

In 2006, Wal-Mart also publicly announced a highly ambitious seafood goal to carry 100 percent MSC-certified wild-caught fish in its stores within three to five years. As the supply of MSC-certified fish is currently far from adequate to meet Wal-Mart's demand, this public announcement is effectively a commitment to buy from all fisheries that become MSC-certified.

In its sourcing of consumer electronics, Wal-Mart typically avoids long-term purchasing commitments and maintains low inventory levels because of the industry's high uncertainty of demand and significant risks of inventory obsolescence. However, to acquire personal computers that were compliant with the EU Restrictions on Hazardous Substances (RoHS) Directive as part of its efforts to carry more environmentally friendly electronics, Wal-Mart made a commitment to Toshiba to buy 12 weeks' worth of inventory as opposed to its more typical four-week commitment. "We'll take that risk," said Alex Cook, electronics buyer for Wal-Mart. "We want to be the first one in the U.S. to sell RoHS-compliant PCs."

At the end of 2006, Wal-Mart found that the tangible profits generated by its sustainability strategy in the first year of implementation were roughly equivalent to the profits from several Wal-Mart SuperCenters.

5. Cutting out the Middleman

An immediate but unanticipated benefit of MSC certification in the seafood network—and of organic cotton certification in the textile network—was full visibility of the chain of custody, and hence the opportunity to eliminate intermediaries. Said network captain Redmond:

> *One of the problems we had was how much of our fish was coming to us third-, fourth-, or even fifth-hand. Sometimes our supplier turned out to be nothing more than a packer that was going out to a market saying, 'I need 50,000 pounds of salmon no matter where it comes from.' Through the chain of custody, we started to see when fish was being handled four or five times, and we knew it couldn't be good for the fish [since texture and flavor fish degrades over time, especially through freezing and refreezing]. And it's certainly not good for traceability. It brought us a lot more awareness about our supplier base, so now things come to us a lot more directly.*

By simplifying its supply chain, Wal-Mart reduced the frequency of seafood stock-outs, improved the quality of the fish it was receiving, reduced paperwork and transaction costs, and reduced the costs and environmental impacts of transportation.

In the textiles network, Brandner noted: "We used to buy cotton from Turkey, ship it to China for spinning and knitting, and then ship it again to Guatemala to be cut and sewn. Now, by looking more deeply at the supply chain, we're finding opportunities to do things like eliminate the shipment to China and have all processing done in Guatemala." Going direct to Guatemala saved time and money for Wal-Mart.

Despite the benefits demonstrated in the examples above, Wal-Mart is unlikely to completely eliminate its intermediaries. For example, the former CEO of a major coffee supplier to Wal-Mart sees excessive risk in eliminating coffee brokers and contracting directly with coffee farmers. His concern is that if a well-known company, such as the one he led, contracted directly with a farmer, and then the spot price for coffee went above the contract price, his company could not hold the farmer to the contract price. If it did, then NGOs would criticize the company for harming poor farmers and its reputation would suffer. Therefore, contracts with coffee farmers could effectively only place a floor on the price that his company would have to pay. In contrast, anonymous coffee brokers could hold farmers accountable to the contracted price. Contracts are important for providing incentives for investment and securing a supply of coffee, particularly when prices are low but likely to rise sharply in the near future.

6. Consolidating Direct Suppliers

Over the short term, Wal-Mart has had many diverse relationships with many factories, often working with a supplier one purchase order at a time or one season at a time. Year to year, the company may easily switch from one supplier to another. The result: it has been tough to obtain improvements on issues such as environmental compliance because the retailer's relevance to those suppliers has been low. Says sustainability vice president Ruben: "Right now we account for two percent of a lot of people's business, especially overseas. We know that needs to be a lot larger—maybe 50 or 60 percent."

So Wal-Mart is now starting to consolidate its business with select groups of direct suppliers. "We're trying to stimulate a race for the top," explained Laura Phillips, president and divisional merchandise manager of entertainment/wireless for Wal-Mart and co-captain of the electronics network. The race-for-the-top concept means that suppliers would be motivated to innovate in environmental performance in order to maintain or expand the amount of business they received from Wal-Mart.

For example, Manish Kumar, CEO of the Fishin' Company, Wal-Mart's top supplier of frozen fish fillets in the U.S. since 2005, was working with the WWF to draw more fisheries and processors into the MSC certification program even though this added significantly more complexity, time, and effort to the job without increasing near-term profits. "I had no idea what the MSC was in January [2006]," said

Kumar. "Today, I spend half my day, every day, working on something related to the MSC." Kumar felt that his efforts were helping to secure and expand his business with Wal-Mart in the long-term. "It's definitely brought us closer. I think there's a lot more trust now in our relationship," he said. "They're willing to let us talk on their behalf, defend their points, and explain to the businesses we work with how important this effort is. And, because we have the muscle of their business behind us, we can go to a plant or a fishery and persuade them to become certified."

7. Restructuring the Buyer Role

To better manage relationships with suppliers, the textiles network implemented a major organizational change: It redesigned the role of its buyers. In the past, textiles buyers had been generalists, handling a wide variety of responsibilities (as buyers did in other product categories). The textiles network divided this function into four different job categories:

Wal-Mart may miss opportunities to source innovative products that customers might want but which are not necessarily environmentally friendly.

- **Merchandising** (buyer)—Focused on the customer and understanding what the product assortment should be to best meet the customer's needs.
- **Product Development**—Focused on product design and trend execution—marrying what the buyer says the customer wants with what the trends are in the marketplace in order to drive development of the product.
- **Technical Services and Sourcing**—Focused on creating the technical specifications for each product, deciding how to package it, and determining the best sourcing strategy, including supplier negotiations, pricing and quality.
- **Planning and Execution**—Focused on financial planning, ordering and inventory management, and store layout.

In the new model, representatives from each of these four "centers of excellence" were co-located as members of a tightly integrated product team. Each was given the chance to become a specialist and to take a more strategic approach to their role. In particular, sourcing specialists were meant to develop and nurture the longer-term relationships with suppliers that were necessary to support activities such as the organic cotton project and other sustainability initiatives. Sourcing specialists were encouraged to hold the position for many years. According to Brandner, this organizational change, backed by the company's focus on the environment, is leading her team to "become smarter merchants," she says.

Sustainability leader Elm saw this type of change as essential to the long-term viability of Wal-Mart's sustainability strategy because in Wal-Mart's traditional business model, the buyers rotated positions every 12 to 18 months. Only by increasing the longevity and depth of personal relationships in sourcing, he believed, would Wal-Mart truly be able to develop and maintain the future-looking, trust-based relationships with suppliers needed to drive ongoing environmental innovation.

8. Licensing Environmental Innovations

In Wal-Mart's electronics network, suppliers' sensitivity about intellectual property is a barrier to improving environmental performance. Said Blu Skye's Scot Case, who worked with the electronics network: "There are all sorts of concerns about confidential business information and suppliers being reluctant to supply information to Wal-Mart because it might somehow end up in the hands of their competitors. For example, if one factory is significantly more energy-efficient than others, it's got an advantage. If it shares that information, the competition might gain a much better understanding of its production costs and therefore its profit margins." Some suppliers fear that this type of information potentially could be used by Wal-Mart in price negotiations. On the other hand, "With anything that can be easily tested, most suppliers are more comfortable providing," explained Case. "Information about how much energy a product consumes is not particularly sensitive."

This hesitancy to disclose is challenging to Wal-Mart, and not just from a performance management perspective. As Seong Ohm, vice president and divisional merchandising manager of electronics for Sam's Club and co-captain of the electronics network put it: "If someone comes up with a better, more sustainable way to do something, we want to encourage them to share that with other suppliers to increase the impact." As a result, the electronics network was encouraging suppliers to license their environmental innovations. The opportunity to derive additional revenue from an environmental innovation would increase the suppliers' incentives to invest in innovation, while licensing the innovation also would lead to improved environmental performance across the industry and more widespread benefits for Wal-Mart.

Three Traps to Avoid

In collaboration with its suppliers and with environmental nonprofits, Wal-Mart is dramatically reducing the environmental impacts of a portion of its products and production processes while increasing its own profits. At the end of 2006, Ruben and Elm found that the tangible profits generated by Wal-Mart's sustainability strategy in the first year of implementation were roughly equivalent to the profits from several Wal-Mart SuperCenters. Intangible benefits, such as public goodwill and improved assurance of supply, are likely to be worth much more to the retailer. Ruben and Elm envision a huge array of untapped opportunities, and they are committing to scale up Wal-Mart's efforts to green its supply chain.

Some of Wal-Mart's "Greening" Decisions

- Buying diesel-electric and refrigerated trucks with a power unit that could keep cargo cold without the engine running, saving nearly $75 million in fuel costs and eliminating an estimated 400,000 tons of CO_2 pollution in one year alone.
- Making a five-year verbal commitment to buy only organically grown cotton from farmers, and to buy alternate crops those farmers need to grow between cotton harvests. Last year, the company became the world's largest buyer of organic cotton.
- Promising by 2011 to only carry seafood certified wild by the Marine Stewardship Council, a group dedicated to preventing the depletion of ocean life from overfishing.
- Buying (and selling) 12 weeks' worth of Restrictions on Hazardous Substances (RoHS)-compliant computers from Toshiba.

It won't all be plain sailing. Wal-Mart faces three possible obstacles as it scales up its network approach: (1) increased costs, (2) a sub-optimal product assortment, and (3) criticism of factory labor conditions. Wal-Mart's public reputation is on the line as it makes ambitious public promises—for example, to sell only MSC-certified wild-caught fish within three to five years. Becoming more dependent on fewer selected suppliers, the retailer may face price rises from that narrower supply base, particularly in times of scarcity and for limited resources like MSC-certified seafood.

Additionally, with fewer suppliers and a focus on sourcing environmentally-friendly products, Wal-Mart may miss opportunities to source innovative products that customers might want but which are not necessarily environmentally friendly. Wal-Mart's environmental nonprofit network partners will continue to push for environmental attributes in choosing product assortments. Although Wal-Mart might in the future be rewarded with offset credits for reducing CO_2 emissions—through its heavy and successful promotions of "green" light bulbs, for instance—it is unlikely that the company can recapture all of the environmental value created by promoting green products, and might end up with a product assortment that is suboptimal for the purposes of maximizing the company's own profits.

Wal-Mart has also long been criticized for poor labor conditions in its suppliers' factories.[16] In response, in his October 2005 speech, Lee Scott said: "We are committed to increasing our engagement concerning supplier factory conditions… We are separating factory certification from the buying organization."[17] This will avert potential conflicts of interest that arise when buyers can obtain less expensive products from noncompliant factories, but it might exacerbate the worst labor-related problems that tend to occur when buyers under-forecast and then demand overtime production—as was discovered in Nike's supply chain.[18] Separation of factory certification from the buying organization may cause a loss of information and coordination, which runs counter to Wal-Mart's strategy of embedding responsibility for reducing environmental impacts within the buying organization.

Going forward, Wal-Mart must be vigilant if it is to avoid these three possible pitfalls and continue to manage its supply chain in a manner that reduces environmental impacts and increases its profits. Indeed, Wal-Mart's sustainability strategy must be profitable if it is to be sustainable in the long run and achieve Lee Scott's aspirational environmental goals.

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BENCHMARKING: Get the Gain Without the Pain

Benchmarking your supply chain performance can be a costly and time-consuming exercise. And as often as not, it doesn't really produce the results you hoped for. It doesn't have to be this way. A new benchmarking approach from the Supply-Chain Council called SCORmark takes out the noise surrounding benchmarking projects and focuses your improvement efforts on where they're needed most.

By Joe Francis

Joe Francis (jfrancis@supply-chain.org) is chief technology officer for the Supply-Chain Council(www.supply-chain.org).

Several years ago when I worked at Compaq Computer, I watched as our new CEO, Michael Capellas, briefed managers on the company's financial results. The people around me were whispering in surprise as the numbers were revealed. Though profitability had been eroding amidst fierce price wars, our cash position was somehow growing—and growing dramatically. Despite profits that in 1999 had fallen nearly 70 percent from two years previously, some $3 billion had flowed into our treasury since 2000. Of that, $300 million in cost of capital savings had gone directly to the bottom line.

The source of the newfound wealth was a mystery to many in attendance… but not to me. It followed a supply chain benchmarking program that we launched in 2000, the first benchmark that I had done using a tool called the SCOR (Supply-Chain Operations Reference) Model from the Supply-Chain Council. SCOR let us quickly compare the supply chain practices of Compaq's internal divisions against each other, an exercise that would have otherwise taken months or perhaps years to complete.

The benchmarking program also enabled us to pinpoint the most important bottlenecks in our supply chains and to identify needed performance improvements. One by one, we began fixing these supply chain operations. Very quickly, substantial savings in cost, cycle time, inventory and working capital began flowing in, as reported in the CEO's financial review to most everyone's astonishment. The reality is that benchmarking one's supply chain operations internally or against external operations can generate hundreds of millions—and sometimes billions—of dollars in cost savings and revenue improvements.

Another important reality is that benchmarking brings a necessary level of objectivity to performance evaluation. The subjective notion that "We think we're pretty good" isn't really good enough. That was the trap we fell into at Compaq when it came to order cycle time until the benchmarking told us otherwise. The reality is that self-opinion doesn't truly matter to customers, who are comparing you against other suppliers.

My benchmarking experiences at Compaq gave me good insights into the challenges most companies must face in comparing their operational performance across the organization and against external entities. Since that time, I have been part of the Supply-Chain Council's effort to help companies bench-

mark their supply chains internally and externally. With our partner APQC (www.apqc.org), one of the world's premier benchmarking and best practices organizations, we launched our benchmarking program, called SCORmark, in 2007.

This article describes the evolution and core components of that benchmarking initiative. It outlines the recurring challenges managers face in attempting to benchmark their supply chain operations and explains how the SCORmark approach addresses those challenges. Finally, we describe some real-world experiences of the benchmark's users.

Some Basics of Benchmarking

Before going further, it might be helpful to provide some basic definitions and describe my earlier benchmarking experiences at Compaq to put things in context.

There are two main types of benchmarking: qualitative and quantitative. They both share certain essential features, but have quite different purposes and outcomes. In qualitative benchmarking, often called "best practices" or "leading practices," managers gather data on techniques for solving supply chain problems and improving performance. If you were having issues with supplier forecasting, for example, you might look at your capabilities with regard to demand planning, S&OP, and CPFR. These techniques are generally applicable, provide valuable results, and have good staying power. Managers compare their techniques to those of organizations with similar supply chains. They then analyze the differences, looking for opportunities to improve certain processes. When you say "benchmarking," many companies think only of this type of qualitative benchmarking. Basically, this was the type of supply chain benchmarking program we conducted at Compaq.

Quantitative benchmarking involves examining a given supply chain and gathering data on performance, not practices.

The second type is the quantitative benchmarking of key performance indicators (KPIs), business metrics, and scorecards. This activity involves examining a given supply chain and gathering data on performance, not practices. Managers then compare this performance data to those of organizations with similar supply chains. The goal is to identify any performance differences and note which processes need to be improved and by how much (that is, what new standards need to be attained). Companies often conduct this type of quantitative benchmarking while doing a financial review of company performance. They also frequently use quantitative benchmarking to tie the company's supply chain goals to its overall strategy.

Our benchmarking efforts at Compaq were mainly of the qualitative variety. We had a relatively easy time launching the program as the head of supply chain strategy was the sponsor. He had the authority in the management hierarchy to compel the participation of supply chain managers throughout the company. We also had urgency around the program because of loss of market share. It was clear we didn't have a robust strategy linking top-line performance and supply chain tactics in a changing computer market that saw Dell and HP in particular achieving rapid growth. The qualitative analysis confirmed that we definitely didn't have a detailed linkage between strategy and operations in the field.

In retrospect, however, I realize that it wasn't a perfect program. We were unsure of which areas to benchmark, so we covered all possible supply chain processes and metrics companywide. This turned out to be a complex undertaking, and ultimately we covered a lot of areas needlessly. The program took us the better part of four months and cost about $350,000 in fees with our Big Five consulting partner. The results we did achieve were highly dependent on the consulting firm's organization of the approach, analysis, and communication of the outcome. Yet all of this "walked out the door" after the consultants issued their final report.

We were satisfied with the results, but I was dissatisfied with the process. We had a wide but fairly shallow (internal) benchmark that gave us valuable direction. Yet we found it difficult to prioritize and focus the program because it was so large and covered so many different supply chains. Moreover, we didn't get any real detail on what activities needed improvement and by how much.

In the end, we decided to focus on order cycle time (and inventory) in three of Compaq's seven major supply chains. Order cycle time then stood at 27 days average, and we had months of inventory. We had very low maturity practices to manage order cycle time. Yet we found that by correcting some of the deficiencies in how we managed processes, we could reach a five-day average order cycle time with at least two weeks less inventory. This focus would end up saving weeks of cash cycle time, which resulted in the billions of dollars of working capital savings. Each day of working capital was worth a few hundred million dollars. Twenty days of improvement later we hit the $3 billion mark in capital, and $100+ million in profit improvement—my first billion-dollar SCOR project!

Several years later, after the merger of Compaq and Hewlett-Packard, we undertook another benchmarking program to look at internal costs in one division. At the outset, it seemed simpler than the broad Compaq study. Since it was quantitative rather than qualitative, we didn't have to juggle huge masses of best-practice data. In addition, the project focused on one specific metric rather than trying to aggregate and align process, metrics, and practices. Among the other plus factors: we had a relatively easy time with the benchmarking launch; C-level sponsorship; the appropriate authority in the management hierarchy (as head of business process management, I worked with his head of strategy to execute the program); and the post-merger urgency to reduce costs significantly.

Despite these favorable conditions, this turned out to be the most painful benchmarking I've ever been through. Instead of using industry standard metrics that showed how we compared against our competitors, we ended up with highly customized metrics and views on the data. We worked again with a Big Five consulting firm (different from the first one) that did the custom research on competing companies, burned through about $400,000 in fees, and spent months gathering data and performing analysis. In this case, we had a narrow but deep benchmark (internal and external) that gave us good direction. However, lack of standards for comparing the performance data created a lot of extra work. And once again, we did not develop any in-house competency as the consultants did all the organization, research, analysis and communication of the benchmark results.

The Challenges of Benchmarking

Through experiences with these and subsequent programs, I've identified some recurring challenges with regard to instituting an effective benchmarking initiative. These include:

- **Sponsorship**—every benchmarking initiative needs a sponsor, the higher in the organization the better.
- **Scope**—selecting the supply chains to be benchmarked is critical; it's not a simple process.
- **Selection of processes and metrics**—focusing on strategic elements helps keep the program targeted and useful (deep metrics in a few areas rather than many metrics across numerous areas).
- **Standards**—standard definitions of supply chain processes (e.g., what activities are in manufacturing or procurement) enable "like-for-like" benchmarks across divisions or companies. Conversely, lack of standards make meaningful comparisons difficult if not impossible.
- **Sources**—identifying sources of data for metrics and having clear pointers to which processes generate transactional data necessary for calculations.
- **Cost**—benchmarking can be expensive, especially when outside consultants are used. It's not uncommon for the cost of a single benchmark to range between $300,000 and $500,000.
- **Time**—the benchmarking process can take from three to five months; set expectations accordingly.
- **Deriving meaning**—the benchmarking initiative must be structured so that the results produced are meaningful.

So how do supply chain managers address these challenges and conduct benchmarking that is truly effective? In the last five years, Supply-Chain Council members have asked us to build a metrics repository based on SCOR for benchmarking purposes—that is, a scorecard that would let them compare their performance against industry peers and companies outside their industry. Many members in particular wanted to be able to periodically check on a couple of key metrics to see if their performance was in order.

The Supply-Chain Council had to carefully consider how it would respond to this member need, recognizing that compiling the data necessary for even a casual check-up could be a daunting task. In 2005, we began negotiation with APQC to build a SCOR benchmarking resource for our members. In 2006, IBM sponsored the development of the SCC/APQC benchmarking system, which has the trademarked name of SCORmark. The approach we took recognized the value of process reference models such as SCOR, coupled with the value of having access to benchmarking data.

We began the SCORmark development process by asking what were the realistic expectations of a quantitative benchmarking exercise and how could we reach those expectations. We quickly agreed that more than a database of metrics information was required. Rather, we needed a system for performing benchmarking that, to the best of our ability, would resolve the key issues in the benchmarking process. There were some challenges we could not address directly—C-level sponsorship of a benchmarking program, for instance. But we decided we

could address most of the other issues.

First, on the challenge of **scope** and focus. SCOR provides an elegant and effective three-step process for (1) identifying all the supply chains in a given business, (2) prioritizing them according to business impact, and (3) linking them to business strategy. The "supply chain" identification matrix greatly simplifies all of the discussions about "what" supply chains are present. Generated from sales and marketing segment data, and from product and supplier segment data, the matrix quickly gives a commonsense stratification of supply chains for further examination. Exhibit 1 shows such an identification matrix for the fictitious ComfyCo Air Conditioning Company. In this case, ComfyCo identified three supply chains: Big Air, Small Air, and Commercial.

EXHIBIT 1

Supply Chain Identification Matrix for ComfyCo Air Conditioning Co.

Supply-Chain Identification Matrix	Geography-Customer or Market Channel			
	Retail		Commercial	
	Big Box Retailer	Internet Direct	Commercial Building	Commercial Major Acct
Big AirCo		X	X	
Small AirCo	X	X		
Custom Industrial			X	
Standard Industrial			X	X

"Big Air" SC

"Small Air" SC

"Commercial" SC

The supply chain "priority matrix" simply ranks the identified supply chains according to company performance criteria (see Exhibit 2). Then the supply chain "strategy matrix" links the prioritized supply chains to top-level company strategy (Exhibit 3), according to whether each should be superior (S), give you an advantage (A), or be at parity (P) competitively. This is a simple 1-2-3 approach to identifying what to benchmark, instead of spending weeks of agonizing discussion.

Continuing on the issue of scope, SCORmark adopted the NAICS (North American Industry Classification System) coding system. (NAICS replaces the old SIC classifications.) We added in SCOR's standard supply chain types—Make-to-Order, Make-to-Stock, or Engineer-to-Order. Thus, for any company, even complex conglomerates, once managers identify a piece of their supply chain that they want to benchmark, they can unambiguously compare it to similar supply chain types in a given region and industry.

NAICS has more than 1,175 distinct industry codes, which provides a rich set of types to identify almost any possible supply chain industry segment. For instance, a supply chain may be defined as Chemical Industry, European, Build-to-Order. It could be defined as High-Tech Manufacturing, Asia-Pacific, Engineer-to-Order. If you're a toy manufacturer, soybean grower, or IT service provider, there's a category for you to use. There are also segments for different sizes of supply chains based on revenue; so you can compare small-to-small and small-to-extra large if that's your wish. The categories, geographies, and supply chain types were "menuized" to simplify the benchmarker's task of identifying both internal and external supply chains for comparison.

The next challenge addressed was **selection of metrics.** This has long been a subject of intense discussion at Supply Chain Council training sessions on the SCOR model. SCOR has several hundred supply chain metrics organized by purpose (level) and categories. A purpose could be creating and measuring strategy (Level 1), diagnosing process defects (Level 2), or measuring workflow performance (Level 3). All metrics fall into one of five categories based on the metric's strategic impact.

EXHIBIT 2

Supply Chain Priority Matrix for ComfyCo

Supply Chain	Overall Rating	Criteria / Weight	Revenue & Rank		Gross Margin & Rank		Number of SKUs & Rank		Unit Volume & Rank		Strategic Value & Rank	
			20		20		20		20		20	
Big Air	120		1	20	2	20	1	20	1	20	1	20
Small Air	180	Weighted Result Ranking	2	40	1	40	2	40	2	40	2	40
Comm'l	300		3	60	3	60	3	60	3	60	3	60

EXHIBIT 3

Supply Chain Strategy Matrix for ComfyCo Air Conditioning Company

Performance Attribute or Category	Competitive Requirements		
	Big Airco	Small Airco	Comm'l
Reliability	S	A	S
Responsiveness	A	A	A
Flexibility	A	P	A
Cost	P	S	P
Asset Management	P	P	P

S = Superior **A** = Advantage **P** = Parity

These categories are reliability, responsiveness, agility, cost, and assets. Order Cycle Time, for example, is a responsiveness category metric. Cash Cycle Time is an asset-type metric, and so on.

To understand the breakout, consider Cash Cycle Time (Level 1-strategic). This metric is composed of Days Sales Outstanding, Days of Inventory, and Days Payables Outstanding (Level 2-strategy diagnostic). Total Supply Chain Management Cost (Level 1-strategic) is composed of constituent non-COGS process costs—Plan, Source, Deliver, Return (Level 2 -strategy diagnostic), which in turn are composed of costs of each component process (level 3-process diagnostic).

To do a supply chain benchmark with SCORmark, the user needs to select at least one Level-1 strategic metric for each of the five major categories. Further, he or she must prioritize the company's strategy in each of those five categories according to whether the supply chain must achieve superiority, advantage, or parity. One (and only one) superior rating is allowed for analyzing a benchmark, two advantage, and two parity ratings. For the superior category, we would expect managers to select component metrics at Level 2 – strategy diagnostics and some at Level 3 – process diagnostics. For the advantage category, we would expect them to add some component metrics at level 2 – strategy diagnostics. This would build out a benchmark or "SCORcard" of 24 metrics: 5 (Level 1 metrics) + 3 (Level 2 superior metrics) + 10 (Level 3 superior metrics) + 6 (Level 2 advantage metrics). That number is not too big, not too small. Most important, it is sharply focused on company strategy. (See Exhibit 4 for sample metrics selection)

This process is really not as complicated as it may sound. When supply chain managers have a menu of metrics organized by category in front of them, metrics selection becomes almost cut and dried. Selecting Level 1, and then inheriting Level 2 (and Level 3) metrics is a clear and logical process. It is a deceptively simple system because SCOR already has cause-effect data on all strategic, strategy-diagnostic, and process-diagnostic metrics. Rolf Poluha wrote an excellent book[1] that actually articulates the statistical significance (that is, cause-effect relationships and correlations between metrics) for all SCOR metrics. The book provides a fantastic amount of detail for sticklers.

Compare this straightforward process to the seemingly endless benchmarking debates around:

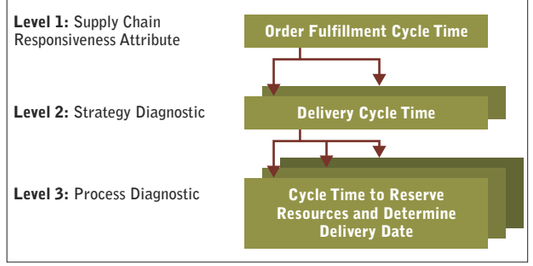
- Metric definitions (what should "complete order" really mean?).
- Which metrics are valuable to our company (a guessing game)?
- How should we decompose the metrics once we've defined them.

I've been through these debates, and they are neither pretty nor short. At Compaq in the mid-1990s, when we were standardizing the definition of order cycle time, on-time delivery, inventory days and related metrics, it took almost a year to achieve a global consensus on how to measure and manage the data.

Responding to the **standards** challenge, SCOR developers have created or adopted the most widely accepted definitions of supply chain metrics in use among around 2,500 companies worldwide over the last 11 years. This greatly facilitates data gathering. For instance, order cycle time is defined as beginning with receipt of a customer order and ending with the customer acceptance of the service or material. There is no debate about interpretation. Managers do not need to undertake (or have consultants undertake) custom programs to create like-for-like comparisons. The SCOR metrics already do that. More significantly, managers do not have to embark on customized programs to gather and reclassify external data—that is, figure out how to

EXHIBIT 4

Sample Level 1, 2, and 3 Metrics Selection



compare their operations to those of other companies.

Another important advantage is that SCOR provides guidance for data gathering. All the SCOR strategic, strategy-diagnostic, and process-diagnostic metrics provide a specific list of process **sources** for the raw data necessary for calculations. With this guidance, companies can readily identify process owners who govern access to IT systems that may hold transactional data. This provides rough back-of-the-envelope planning for data gathering and quality control of the measurements, thereby speeding up the onerous data-gathering phase of the benchmark.

On the challenge of reducing the **cost** of benchmarking, council members and other interested parties can easily learn how to use the SCOR methodology and SCORmark workflow. (For more information on this, see accompanying sidebar.) A consultant may be valuable in providing the manpower to gather the data and manage a big benchmarking program. But managers do not need any expertise in the fundamentals of benchmarking—selecting and defining the metrics, the methodology, and how to analyze the data—outside of the SCOR framework itself. Once a company has standardized on SCOR and trained managers on how to use the model, they can easily execute the benchmarking and interpret the results. No key information "walks out the door" at the program's conclusion.

The SCORmark approach saves time and money. Users avoid the cost of customized benchmarking because the system is based on open standards shared among the SCOR community via the SCORmark system. In effect, access to the standards is part of the cost of membership to the Supply-Chain Council. In addition, SCORmark cuts the time required to conduct a benchmark (assuming that your company manages supply chains with standard metrics) to a fraction of the usual three to four months. In fact, we've seen high-quality benchmarks completed in as short a time as one day, though the norm is typically two to three weeks. APQC will need time to perform statistical validation ("quality checks") of the benchmark data, which can take up to one week. Once your company is known to provide quality data, the statistical validation can be done within days.

Consider the implications of this capability. Instead of spending one or two quarters benchmarking and goal setting with lagging data, a company can benchmark monthly, and identify leading trends and set forward-looking goals on a continuous basis. There are no substantial additional costs in using monthly KPI data (SCOR data), and benchmarking against that data over and over.

Finally, with respect to **deriving meaning** from the benchmark results, we start with the fact that SCORmark is designed around the SCOR methodology. So once managers select their appropriate metrics and identify their company strategy, the benchmark not only places their company relative (by metric) to their industry or selected demographic, but also identifies the targeted improvements needed (see Exhibit 5). The analysis of this benchmark performance gap ties directly into the subsequent phases of SCOR—material flow, work and, information flow—for identifying the root causes of performance problems. It also tells you what projects you're going to need to execute to address the problem areas.

Gaining Access to SCORmark

The SCORmark benchmarking tool itself is available only to members of the Supply-Chain Council (SCC). The cost to join the SCC is $3,000 for a company in one region, for example the United States; $5,000 for companies in multiple regions; and $600 for academics. There are no restrictions on the number of individuals within a company who can log into the tool.

Non-members can view the 2007 benchmark results, but again must be members to participate.

The Supply-Chain Council plans to introduce a half-day benchmarking tutorial in 2008 to be presented around the country. The session will be open to members and non-members alike.

For more information, visit www.supply-chain.org.

EXHIBIT 5

Sample Summary Benchmark Result

Attribute	S/A/P	Metric (Level 1)	You	Parity	Adv	Superior	Target Gap
Reliability	S	Perfect Order Fulfillment	97%	92%	95%	98%	1%
Responsiveness	A	Order Fulfillment Cycle Time	14 Days	8 Days	6 Days	4 Days	8 Days
Flexibility	P	Ups. Supply Chain Flexibility	62 Days	80 Days	60 Days	40 Days	0
Cost	P	Supply Chain Management Cost	12.2%	10.8%	10.4%	10.2%	1.4%
Assets	A	Cash-To-Cash Cycle Time	35 Days	45 Days	33 Days	20 Days	2 Days

Early Experiences with the Benchmark

What are the lessons learned from development of the new SCORmark program? First, many companies have serious difficulty defining their supply chain for the purposes of benchmarking. Many believe they have "a" supply chain (or three or four or five…) when in fact they have a large constellation of supply chains. Using the SCOR supply chain definition matrix technique, companies can easily identify all of their supply chains by major project line/customer segment. They can then choose groupings of these to benchmark based on shared characteristics. I see this as becoming more deeply embedded in the benchmarking workflow because we designed the SCORmark system with the assumption that companies already did something roughly equivalent to identify supply chains.

The biggest hurdle to benchmarking is coming up with standard ways to compare one company's operations with another's in order to make "like-for-like" comparisons.

Second, there is a huge variation in how much detail companies manage in their supply chain data. This became clear when we saw how long it took various companies to beta-test the benchmarking system. Here's a sampling of how long it took companies to gather and submit the necessary data for the benchmark tool:

- Company A: 6 hours
- Company B: 2 days
- Company C: 10 days
- Company D: 6 weeks
- Company E: Abandoned the survey because it was too difficult to get the data.

Now, these companies are in different industries with different levels of supply chain maturity. However, Company A had used SCOR for years, had standardized its operations around the model, and was able to easily pull its standard performance data for benchmarking. Company B also had used SCOR for years. The company had not standardized operations on SCOR metrics, but it did have metrics data that it used in SCOR programs. Company C had good operational metrics, but those metrics were not standardized. Company D had some operational metrics, not standardized. Finally, Company E simply had serious difficulty compiling any metrics. (We also suspect it had trouble in defining its supply chains for the purpose of benchmarking.)

Among the first 30-40 companies using SCORmark, we also saw similar variations in time-to-complete the exercise, with a skew towards taking several weeks to complete. Half our beta testers were relatively sophisticated SCOR users. Those users that had standardized on SCOR could quickly complete benchmark surveys and get frequent updates. That is the ideal situation.

Benchmarking a supply chain clearly can help companies determine their relative performance and shore up operations to stay competitive. But until recently, conducting effective benchmarking quickly and cost-effectively was a monumental task, one that consumed big budgets, patience, and time. The biggest hurdle was coming up with standard ways to compare one company's operations with another's in order to make "like-for-like" comparisons. The SCORmark system has done the heavy lifting of defining those standards. It's now becoming far easier for manufacturers and their supply chain partners to determine whether they're keeping pace and what they need to do about it.

Supply chain benchmarking doesn't have to a complex, costly undertaking. Early adopters of SCORmark have proven that convincingly. If you're looking for a relatively pain-free—yet effective—way of benchmarking your supply chain activities, SCORmark could be right for you, too.

Sources:

[1] Poluha, Rolf G. Application of the SCOR Model in Supply Chain Management. Youngstown, NY: Cambria Press, May 2007.

HOW TO SPOT— and HELP—an AT-RISK SUPPLIER

Current economic realities make one thing clear: today's business continuity needs cannot be met by using yesterday's risk-management approaches. That's especially true when it comes to your suppliers, who should they falter have the potential for derailing your operations. Supply chain managers need new mechanisms to spot "at-risk" suppliers—and proven processes for intervening to reduce the impact of those suppliers' problems.

By Foster Finley

"Dear Customer: We are liquidating and are unable to fulfill our current orders on file for you..."

With little advance warning, supplier communiqués like this are becoming increasingly common in an economic environment that saw 2008 bankruptcy filings in the United States jump by 54 percent from the prior year. Even if your key suppliers are not filing for bankruptcy or ceasing operations, you may be still confronted with actions that disrupt the continuity of supplies or significantly affect your finances—actions such as take-it-or-leave-it price increases, demands for faster payment terms, delivery of less-than-ordered quantities, and longer delivery lead times.

The impact is global and affects nearly every industry. Edscha, a German manufacturer of sun roofs, door hinges and other car parts, filed for insolvency in early February 2009. The production interruption forced a key customer, BMW, to make undisclosed incremental payments to Edscha to support the supplier's continuing operations so the automaker could meet a planned product launch.

Similar scenarios are playing out elsewhere. In the U.S., the challenges faced by automotive Tier One supplier Delphi have been front-page news. The Chapter 11 bankruptcy filings of storied brands such as packaging producer Smurfit-Stone Container and industrial equipment and chemicals maker Milacron have added to a growing list of distressed businesses that appears in nearly every industrial sector, regardless of the size of those businesses.

Foster Finley is a managing director at AlixPartners LLP. He can be reached at ffinley@alixpartners.com.

Raising Your Risk Management Game

The impact of supplier vulnerability has made it doubly critical to safeguard supply continuity. That concern has brought two imperatives to the fore: The need for supply chain managers to spot financially "at-risk" suppliers and the importance of intervening to stave off or plan around those suppliers' problems.

Unfortunately, we have observed few supply management functions that are skilled at assessing the financial viability of their suppliers—particularly the viability of small private enterprises. We recently reviewed a request for proposal from a highly respected global manufacturer that was 130 pages in length. The RFP required respondents to provide specifics about: local product content, diversity programs, management structure, and environmental responsibility. However, we could not see a single question that addressed the supplier's financial viability.

If few supply-management functions are adept at identifying financially distressed suppliers, even fewer are equipped to intervene when a supplier encounters financial distress. Mounting economic pressure has undermined the viability of many companies—customers and suppliers alike that took on debt during better times and structured themselves for business levels that never materialized. So more suppliers are facing difficulties while too few of their customers have adequate processes for detecting suppliers' problems early enough to take preventative measures. Consequently, many procurement groups are discovering suppliers' distress at advanced stages of "metastasis," when the costs of main-

taining supply continuity are at a premium.

The following example puts the dangers for customers in sharp relief. Following more than 10 months in bankruptcy, automotive supplier DriveSol announced that it was liquidating its U.S. operations at the end of 2008. The company's announcement to its customers acknowledged their inability to re-source DriveSol's products on short notice and indicated that their requirements would be met with a shift to DriveSol's continuing European operations.

As global supply chains become more complex and expansive, it becomes increasingly evident that today's needs cannot be met by using yesterday's risk-management approaches.

However, DriveSol's notice also indicated that supply continuity would require a substantial surcharge, prorated across the customer base, to be collected over only three months. It also stipulated 10-day payment terms on all orders. Customers were given just a few days in which to accept these requirements. While most customers were aware of DriveSol's financial distress, many were caught off guard by the financial implications of its spot demands. Few were in a position to pass on the additional costs to end customers; for some customers, the extra cost burden raised the threat of having to shut down production lines.

Most supplier risk management processes across industries simply have not anticipated these kinds of events. As current economic realities disrupt more and more global supply chains, it becomes increasingly evident that today's needs cannot be met by using yesterday's risk-management approaches.

What's needed now is a fundamental shift in the processes and mechanisms for monitoring suppliers. Effective supply management functions must incorporate structured, routine, data-supported ways to assess their suppliers' financial viability—in addition to many of the traditional supply management activities. Today, best practice in supplier risk management (SRM) must blend assessment of the supplier's financial viability with other relevant metrics for a composite rating that can be weighted and adjusted to suit the business environment. This monitoring process might include: product quality ratings, on-time service performance, or a qualitative assessment of a supplier's management team. Such a composite score continually prioritizes the riskiest of the at-risk suppliers.

Inclusion of a supplier's financial viability can prove invaluable far beyond the current downturn. It now must be developed as a core competency—as a competitive differentiator with which to safeguard supply continuity.

Identifying the High Priority Suppliers

A first step in practicing effective SRM is to highlight the true priority suppliers. Fortunately, many supply management functions already maintain some form of prioritized supplier listings, and these may provide a helpful starting point. These existing processes may be based on metrics such as overall portion of procurement spend, historical delivery performance, indirect vs. direct products, threat of labor interruptions, or product quality variations, for instance.

However, while these are all relevant considerations for highlighting priority suppliers, they fail to address the underlying question of overall dependence upon any given supplier. Even small and medium-sized enterprises have hundreds and sometimes thousands of suppliers. Moreover, the goods and services acquired from those suppliers will vary dramatically in terms of how essential they are to ongoing operations. When we discuss the topic of high-priority suppliers with supply chain leaders such as chief procurement officers, we find four mindsets that distract them from properly pinpointing criticality:

1. *A focus on price escalation or commodity volatility:* Many companies are reliant on commodities such as oil, sheet steel, copper, and aluminum. And given the meteoric rise and subsequent fall of prices of those commodities, it's easy to understand why so many companies spend so much time and attention on budget forecasts, market outlooks, hedging positions, and customer surcharge management. But most often, the risk is borne proportionately across the customer base so it is less often linked to the potential failure of any one supplier.

2. *Siloed organizational structure:* Category specialization can make global comparisons difficult because different groups of supply management specialists focus on discrete pockets of information. It is not uncommon for the supply management function to be organized by, say, direct materials, indirect materials, capital expenditures and services— with further subdivisions within each category. While informed purchasing professionals and buyers are equipped to describe their most strategic or difficult-to-replace supplier, making organization-wide comparisons in search of critical suppliers is very difficult.

3. *Adherence to the Pareto principle:* There is a natural tendency to interpret a supplier's criticality in terms of relative annual spend, or of units or weight of a product purchased. Financially, it makes sense to lavish attention where the most money is spent. But in many companies, this is a poor proxy of true criticality because it fails to take into account either the business importance or the relative difficulty of re-sourcing a supplier of a product that accounts for a large spend. For example, a transportation-intensive shipper could rightly point to its reliance on a particular less-than-truckload (LTL) carrier as a proportion of its spend base. But it would be much harder to declare that that carrier was critical because of the relative ease of finding alternate LTL carriers.

4. *Focusing on the "tallest nail":* Every company has one or more problem suppliers that consume disproportionate amounts of managerial attention. Product quality issues, lack of responsiveness, unreliable delivery, aggressive pricing, or just the most recent "one-time issue" all provide rationales for meetings and resolution. Except in the most unusual cases, customer and suppliers reach an accord over time—or they part company. But, time-consuming suppliers are not de facto critical suppliers.

These four mindsets are fundamental to good supplier management, and we do not intend to diminish their importance. But satisfying the demands of the here and now—of day-to-day supplier management—can obscure the more fundamental question of overall supplier criticality and risk management. The starting point is to isolate the suppliers without which key production lines or service capabilities would grind to a halt in very short order. The central question is this: "If this supplier failed in the next few months, what would be the impact on my business?" More specific questions to test reliance include:

- Are the supplies sole-sourced and are there viable alternative sources?
- Who owns the production tooling? Can tooling be relocated to other suppliers?
- What is the current inventory position and how much more consumption can it support?
- Is product engineering or redesign necessary in order to relocate supply?
- How lengthy are product qualification cycles? Must customers approve supplier changes?
- What is the risk of interruption of raw materials to the supplier?
- Do geographical distances or local regulations impact control?

Both quantitative and qualitative considerations go into these assessments. We have found that a practical and time-efficient approach involves ranking suppliers in even quintiles from most strategic to least strategic (so as to avoid the occasional tendency to discover that nearly all suppliers are "highly strategic"). This approach requires that if there are, say, 100 suppliers, no more than 20 can be in any individual quintile ranking. The output from this analytic step is used to stratify all suppliers along the dimensions of strategic importance to the business; the same approach is then applied along a continuum of difficulty to re-source the goods or services provided. Specifically, we seek to prioritize those suppliers that fall into the upper right quadrant, denoting high strategic importance and high switching difficulty. (See Exhibit 1.)

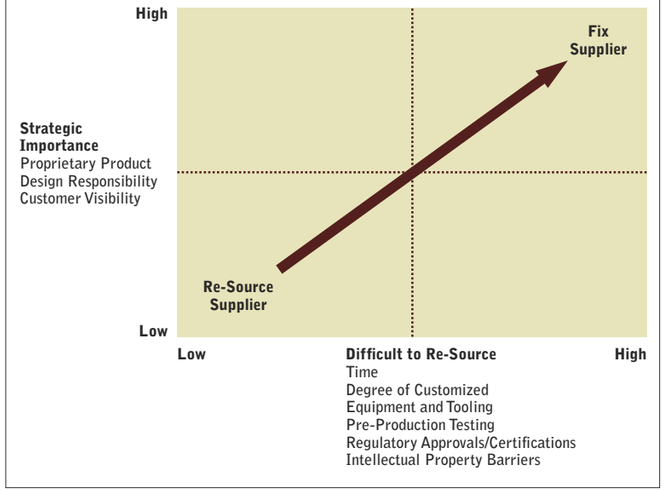
After a supply management executive in the printing industry conducted this analysis on his supply base, he was surprised by the degree to which the truly critical suppliers differed from his previous perception of what "critical" meant. For example, this manufacturer had always regarded one chemicals supplier as critical since it had long been a sole source producer of proprietary compounds. However, closer scrutiny of the supplier's performance, followed by competitive sampling, made it clear that there were viable alternatives and suppliers to meet production needs. Conversely, the process highlighted a few suppliers that had previously been considered inconsequential—prompting a much closer focus on their status and performance.

Assessing Financial Distress

Once you have identified your high-priority suppliers, the next step is to assess their financial viability.

EXHIBIT 1

Pinpointing the Most Critical Suppliers



For many supply management functions, this can be a daunting task. Commonly available supplier financial reports typically fail to adequately reveal the supplier's overall liquidity position, which is an all-important measure of any company's ongoing sustainability. Moreover, suppliers that are privately owned often reveal little or no financial information.

There are many valuable and comprehensive sources of financial data with which to assess suppliers' financial viability. However, we have seldom seen all the collected data, across the multitude of suppliers, successfully translated into cogent indicators of financial distress. In one case, a customer kept a detailed and up-to-date "key suppliers" folder. In addition to internal reports on supplier performance, the folder contained the annual reports, 10-Ks, 10-Qs, sector coverage reports from several investment analysts, chronological transcripts from the earnings calls as well as reports purchased from financial information bureaus. Most buyers could readily describe suppliers' metrics such as recent stock price performance, executive compensation, the fiscal calendar, key competitors, and whether business was growing or declining. However, nobody with whom we spoke at that company could quantify supplier liquidity beyond subjective quotes from analysts' reports—much less rank suppliers by the extent of financial distress.

If needed information is publicly available, or if your privately owned supplier is willing to share details, the Altman Z-Score can be applied as a general predictor of financial distress. This reliable metric was introduced in 1968 by New York University Professor Edward I. Altman. The lower the score on a 0 to 5 scale, the greater the likelihood of distress. The Altman Z-Score equation comprises five financial ratios: Working capital to total assets; retained earnings to total assets; earnings before interest and taxes to total assets; market value of equity to book value of total liabilities; and sales to total assets.

The Altman Z-Score can certainly help supply chain managers to quantify and rank suppliers with more rigor than they may have done previously. However, it is only a general predictor that varies dramatically based on factors such as asset intensity or industry structure. Over the past decade, we have used a proprietary Early Warning Model (EWM) tool. The EWM analyzes a number of company-specific financial factors and produces a likelihood of distress, on a scale of 0-100 percent, over a forward-looking, two-year period. The higher the value, the higher the likelihood of distress.

Context—such as comparisons within peer or industry groups—is vital to interpreting the condition and extent of distress. In Exhibit 2, the deterioration (red line) of a process-industry company is apparent, leading to the company's bankruptcy filing. At the same time, two other producers in the same industry (blue lines) are exhibiting clear indications of stress, while the remaining peers (green lines) are all tracking below the 15 percent level. It is easy to spot the prospective suppliers that should be cause for concern. Moreover, by periodically monitoring each company's absolute distress level, one-time increases in distress, and period-over-period deteriorating trends, it is possible to flag at-risk suppliers just as the first distress signs appear.

It is not unusual for suppliers to be surprised when their financial viability is first challenged. However a fact-based conversation dispels emotions, facilitates a constructive dialog, and can lead to early preventative actions among receptive suppliers. For recalcitrant suppliers or suppliers on a deteriorating path, the advance warning can provide supply chain managers with an early jump on alternative plans—thus avoiding the premiums associated with crisis responses at the last minute.

We have learned that many companies exhibit early signs of distress when there are months, if not years, of lead time before they hit crisis levels. It is possible to monitor average distress levels of tracked companies that filed for bankruptcy protection, contrasted with the number of months prior to filing, during each of three calendar years: 2007, 2008, and 2009 (through April). (See Exhibit 3.) The data suggest that in the cases of suppliers that cross a 40 percent probability level of crisis, there is, even in the worst cases, more than a full financial quarter in which to take corrective action. While a 40 percent-plus rating is no guarantee of failure, it implies that proactive intervention or contingency planning significantly improves customers' chances of uninterrupted supply or crisis response, much as early detection of a disease can help forestall its worst effects.

EXHIBIT 2

Context is Vital to Assessing Distress

Process Industry Peer Group at Three Digit SIC Code

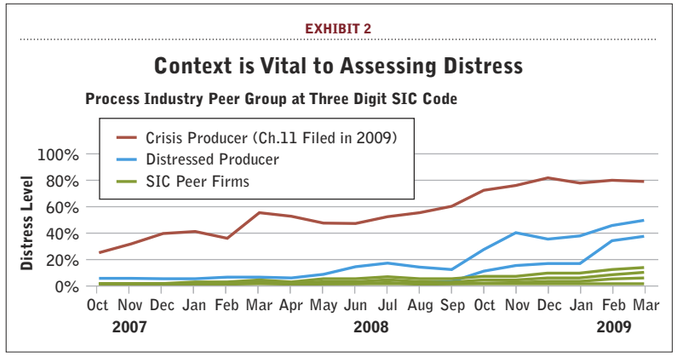
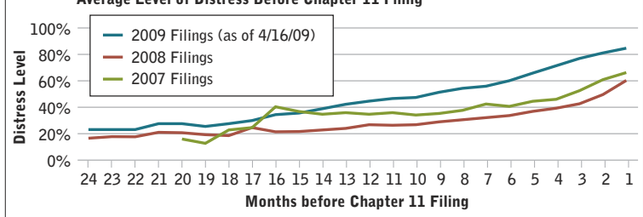


EXHIBIT 3

Spotting the Warning Signs of Distress

Average Level of Distress Before Chapter 11 Filing*



* Publically traded firms with sales >$250 million (>$500 for retail firms) and assets>$100 million

In our experience, it is essential to open confidential dialogs with high-priority suppliers whose probability of distress exceeds 40 percent. This gives supply chain managers an opportunity to assess the circumstances first-hand and judge whether the supplier's distress level is a financial anomaly or a signal of mounting distress. Constructive intervention at the earliest stage also means that there are the most degrees of freedom remaining to reverse the course—which is in the best interests of both supplier and customer.

Intervening with At-Risk Suppliers

Highlighting "at-risk" suppliers is only the first, and easiest, part of the SRM process. Once you have recognized that a priority supplier is financially at-risk, it is time to suspend the business-as-usual approach until stability is restored—or until you no longer rely on the supplier. To be sure, many supply management functions have instituted cost take-out programs or other structured mechanisms to contain costs, and these are certainly appropriate ways to ensure competitiveness over the duration of a relationship.

However, during periods of financial sensitivity, aggressive supplier negotiations can inadvertently serve as the *coup de grâce* for a supplier and heighten the likelihood of supply disruption. Consider this recent example from Chrysler's experience. Prior to its own bankruptcy filing, the car maker sought 50 percent price reductions from some of its suppliers, including Aradco Management, a Tier 1 supplier of stampings, modular assemblies and welded parts. With more than 90 percent of its business dedicated to Chrysler, Aradco could not withstand the additional loss of income inferred in Chrysler's proposal. Failing to reach an agreement, Chrysler attempted to move all of its business away from Aradco. Even after obtaining a court injunction granting legal rights to Chrysler for Aradco's parts and tooling, Chrysler was turned away by a union blockade at the Aradco plant in Windsor, Ontario, severing flow to production lines.

To resolve the question of supply continuity, we have to triage at-risk suppliers into two groups based on how badly a supplier's financial picture has deteriorated. Broadly, we categorize them into "distressed" and "crisis," with each category implying different levels of intervention. Let's get into more detail on each:

Dealing with a "Distressed" Supplier. In such cases, the fundamental objective is to improve the supplier's cash flow in order to reduce or reverse its distress level. A good example is the recent case of an intervention at a privately held freight provider. This company was exhibiting early signs of financial distress; its customers were worried about its viability. At the same time, its owner was worrying about how to secure a major cash infusion to tide the company through the economic downturn.

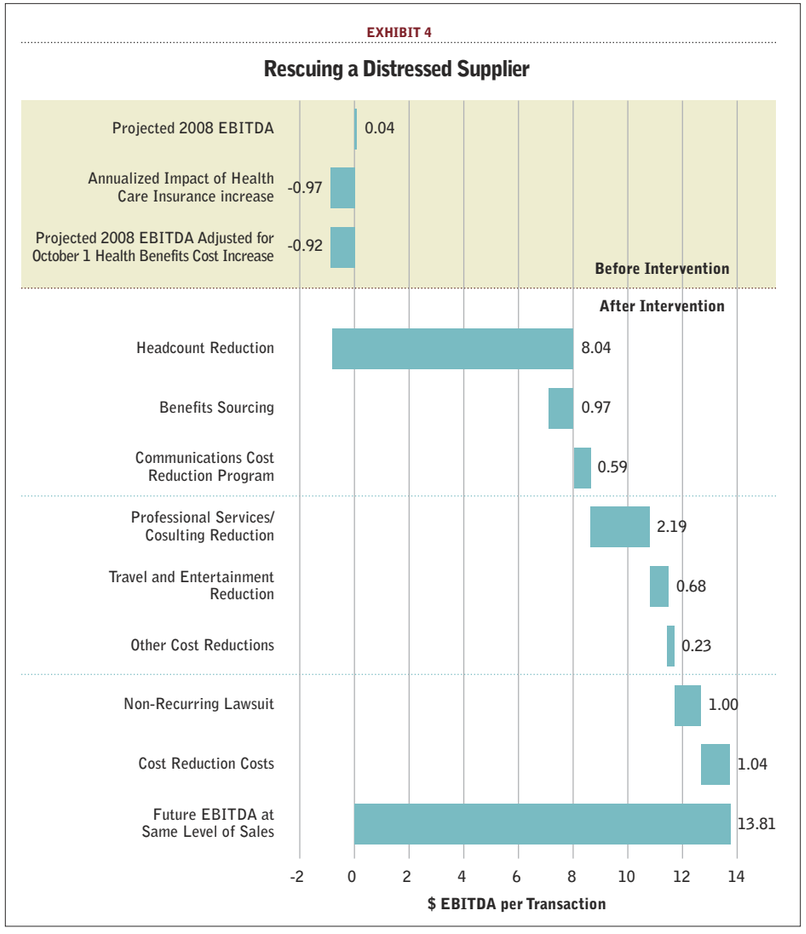
The initial meeting between the supplier's executive team and AlixPartners centered on a detailed review of the company's financials. It was agreed that the company would give priority to immediate and steep cost reductions, which included a freeze on new hires and on planned salary increases, and the appointment of the chief financial officer (CFO) as the "cash czar" to control all discretionary expenditures. The initiative also involved a company-wide program to dramatically improve earnings before interest, taxes, depreciation and amortization (EBITDA) per transaction, by:

- Executing one-time employee severance pay-outs for selected employment contract-based executives whose employment contracts had been thought to be too costly to terminate.
- Implementing a 26 percent staffing reduction to bring operational capacity in line with the business outlook.
- Shutting down services provided by all non-employee contractors whose total costs came at a premium compared to those of full-time employees.
- Eliminating and not replacing non-recurring costs, including ongoing litigation expenses.
- Replacing a health insurance plan that was due for renewal at a higher cost with another provider's more competitive plan that better suited the needs of the new business structure.
- Immediately cutting travel and expense costs for all but essential business purposes.
- Reducing communications costs.

Exhibit 4 shows the relative impact of these key actions over time. After just four weeks, the changes listed above led to a $15 per transaction positive swing in EBITDA, reaching full run rate after 60 days. The

EXHIBIT 4

Rescuing a Distressed Supplier



supplier's CFO noted that had it not been for the intervention, the supplier's liquidity crisis would have necessitated a bankruptcy filing or massive equity infusion by the end of the year.

This case provides a clear example where advanced intervention—well before the onset of a cash crunch—allowed orderly and sustaining improvements with no disruption to service. What is also notable is the contrast between "a plan designed to improve cash flow" vs. a "typical" supplier-development action plan resulting from a customer's visits. In our experience, supply management functions are rarely equipped to engage constructively with suppliers to address issues such as SG&A reduction or health insurance negotiations. Rather, they tend to be oriented toward product quality, service levels and cost containment. Certainly all of those factors are critical, but during periods of acute financial sensitivity, they are insufficient to meaningfully improve supplier liquidity. Exhibit 5 shows a continuum of supplier financial distress along the dimensions of timeframe, focus, actions, and skill sets.

Coping with a Supplier in "Crisis." Typically, a "crisis" supplier has already run out of cash or is about to run out, which cuts short the debate over the need for intervention. Supplies can be at great risk: It is quite possible that payroll cannot be met or the supplier's suppliers have not been paid. The supplier may be about to default on its obligations, resulting in an involuntary bankruptcy filing. Once a company has filed for restructuring, it operates under the protection of the court and in the interests of its debtors. The objective of restructuring is to restore the business to ongoing financial viability. Implications for customers can include: renegotiating contracts and the associated terms; selling, liquidating or shuttering business units to raise cash or stanch financial underperformance; encumbering assets, including parts, tooling and equipment; and even reclaiming cash or assets exchanged during a defined time period prior to the filing.

When a crisis does occur with a priority supplier, it is usually too late to re-source the goods. If supply continuity is in jeopardy, there are several undesirable but prospective steps that a customer may undertake to fill immediate needs. Suppliers' cash flow can be temporarily improved by paying your supplier's supplier directly for the raw materials or inputs for your products. If tooling is controlled under a bailment agreement, it may be possible to relocate it to a different supplier. There are even circumstances in which resources from your organization may run the endangered supplier's production equipment in order to obtain output. Of course, none of these kinds of moves should be more than temporary.

EXHIBIT 5

Supplier Distress Continuum

Supplier Status	Business-as-Usual Supplier	Financially Distressed Supplier	Crisis Supplier
Timeframe	Ongoing	<3-6 months	Immediate
Focus	Product-based (e.g.): • Cost Containment • On-time Performance • Product Quality • Supplier Capability	Supplier-based (e.g.): • Cash Flow Improvement • SG&A Reduction • Product Profitability • Working Capital Improvement	Supplier-based (e.g.): • Cash Generation • Debt Reduction • Monetize Assets from Balance Sheet • Restore Profitability
Required Actions	Periodic audits and performance monitoring, supplier/site visits, development plan management	Confirm supplier's understanding of situation, assess turn-around plan(s), accelerate/execute contingency measures	Work with supplier or creditors to maintain supply or obtain parts/tooling Restore supplier profitability High-speed re-sourcing of parts and services

In one recent case, a mid-sized apparel supplier could not cope with its crushing debt load. After notifying senior lenders that it was unable to meet its debt repayment schedule, the company moved to focus on generating cash, restructuring its manufacturing footprint and supply chain and restructuring its debt.

Specifically, the apparel supplier implemented a 13-week cash flow forecasting model to quickly manage and forecast profitability, established a disciplined cross-functional approach to accelerate collection of overdue accounts receivables from customers, and dramatically reduced working capital tied up in slow or over-stocked inventory. The industrial restructuring focused on three key drivers: (1) reducing the supplier's manufacturing footprint by consolidating the number of production sites; (2) shifting to a more effective and efficient distribution network to reduce costs and simplify the paths for product flow; and (3) increasing scrutiny on discretionary spending such as travel and expenses. The actions taken to preserve cash delivered significant accounts receivable benefits, solid inventory benefits, and a 10 percent reduction in manufacturing and discretionary spending—in addition to a new business plan aligning the objectives of the owners with those of the management team.

Some supply management organizations have the competencies needed to help distressed suppliers. But most lack the skills necessary to turn around a supplier in crisis. So should they develop internal turnaround competencies? In our experience, the incidence of crisis suppliers is not high enough to merit doing so. Instead, their time and energies are better directed toward advanced detection and prevention of financial distress—or toward re-sourcing "at-risk" goods and services while there's still time to do so.

The skill sets, competencies and approaches best suited for these situations are defined as those of a turnaround professional. The recognition of the role of "turnaround professional" is relatively recent. Organizations dedicated to this discipline include the Turnaround Management Association (www.turnaround.org) and the Association of Insolvency & Restructuring Advisors (www.airacira.org). Both organizations offer relevant training and certification programs. Enterprising supply management professionals can dramatically expand their conversancy and familiarity with the field of crisis management and turnaround work through these and other programs. While they do so, there is still no substitute for harnessing experienced turnaround capabilities if they are forced to deal with a supplier in crisis—which of course is what truly effective supplier risk management can help them avoid in the future.

The Financial Viability Factor

In today's world, where continuity of supply is so critical, supply-management professionals must be able to embed financial viability in the overall function of supplier risk management. Specifically, they have to have the data and the analytical methods to be able to highlight the most critical companies in their supply bases. They need to be able to critically monitor and engage any critical suppliers that are showing signs of distress. And they must act to mitigate supply risk by decisively re-sourcing the relevant goods or services or by intervening to support the distressed suppliers.

The skills required for this kind of monitoring and supplier intervention are new for most supply management functions and their professionals. But now they must view these accumulated skills as a long-term competency.

Supplier failures will remain a fact of life, but supply disruptions need not be. We all look forward to a time when we can decrease the weight given to financial viability as a factor in deciding what to source from which suppliers. But for now, we don't have that luxury.

HOW CISCO SUCCEEDS AT GLOBAL RISK MANAGEMENT

Supply chains have become increasingly vulnerable to disruptions, from natural disasters to the global credit freeze. Some companies take a reactive stance to this potential, scrambling to make do when an event does occur. Cisco pursued a different approach: a comprehensive, proactive risk management program that embraces all of its worldwide supply chain partners. Here's the practitioners' perspective on that program in action.

By Kevin Harrington and John O'Connor

One of the largest earthquakes ever to hit China occurred on May 12, 2008. With a magnitude of 7.9, its epicenter was 80 km northwest of Chengdu, capital of Sichuan province. Events like this challenge global supply chains to the limit. For Cisco, the Chengdu earthquake presented a potentially high-stakes test for our new supply chain risk management framework.

Supply chains have become increasingly vulnerable to world events, from natural disasters to the global credit freeze. According to the recent study from IBM titled "The Smarter Supply Chain of the Future," supply chain risk management has emerged as the second largest challenge for supply chain executives after supply chain visibility— placing even higher than increasing customer demands and higher costs.[1] As a result, supply chains and the risks they face have gone from a back-office item to a prominent position on the boardroom agenda for many companies, including for Cisco, the San Jose, California-based provider of networking and communications solutions.

Kevin Harrington is Vice President, Global Business Operations and John O'Connor is Director, Supply Chain Risk Management in Cisco's Customer Value Chain Management organization.

Risk Management Grows in Importance at Cisco

Over the last few years, supply chain crisis monitoring has become a key element of Cisco's Supply Chain Risk Management (SCRM) program within the company's Customer Value Chain Management (CVCM) organization. At Cisco, CVCM is a central function that collaborates with other Cisco teams and external partners to plan, design, manufacture, deliver, manage customer orders, and ensure the quality of the company's products and solutions. Formerly called Global Supply Chain Management, CVCM acquired its new name recently as part of a broader reorganization to better focus on the total customer experience.

In order to drive this program, the Supply Chain Risk Management team partners closely with several other CVCM functions. These include Global Supplier Management (GSM), which oversees sourcing decisions and manages relationships with Cisco's component suppliers globally; Product Operations, responsible for transforming engineering innovation into robust products; and Global Manufacturing Operations, which oversees the company's global manufacturing and logistics operations through a network of outsourcing partners.

Cisco's Supply Chain Risk Management Program consists of four key elements:

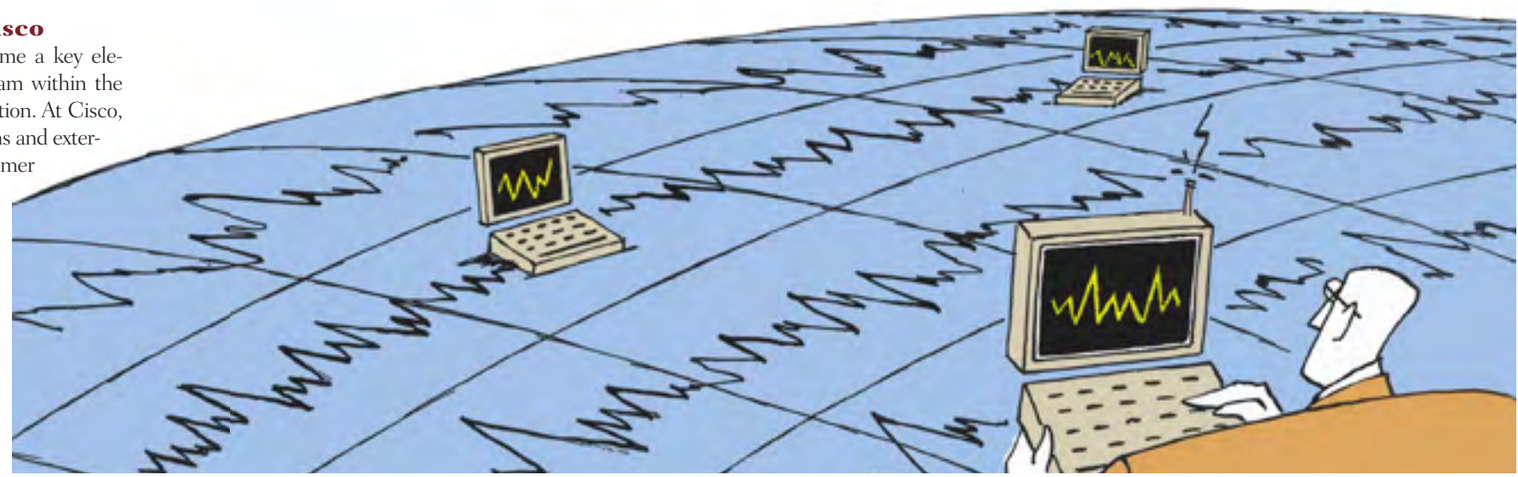
1. Business Continuity Planning (BCP) Program. This provides a strong focus on Cisco's suppliers, manufacturing partners (i.e., the EMS, or Electronic Manufacturing Services companies that do contact manufacturing in this industry), and transportation and logistics providers to document recovery plans and recovery times and drive resiliency standards.

2. Crisis Management. Cisco's global crisis management team is responsible for monitoring and responding to disruptions globally on a 24/7 basis.

3. Product Resiliency. GSM and SCRM teams in particular partner to address three key issues:

- Helping business units make informed and strategic decisions that address vulnerabilities in product design decisions.
- Translating long-term risk mitigation strategies into short-term priorities.
- Reducing the cost of risk mitigation strategies and programs.

4. Supply Chain Resiliency. SCRM works closely with Manufacturing Operations, EMS partners and transportation and logistics providers to identify nodes in the supply chain with recovery times that are outside of Cisco's established tolerances and to develop corresponding resiliency plans.



Key Business Partners

Cisco's Supply Chain Risk Management Program requires a truly collaborative effort to deliver resiliency for Cisco's highly complex supply chain. To illustrate, SCRM partners with Cisco engineering to assess the resiliency attributes for new products. This engagement occurs well in advance of "first customer ship," giving development engineers time, if needed, to consider alternate or more resilient components before the design is finalized. Similarly, SCRM engages with the Product Operations and Manufacturing Operations functions to assess the resiliency attributes of the anticipated build-to-ship supply chain. This forward-looking assessment allows Cisco to incorporate supply chain resiliency as a consideration in supply chain design and business awards to EMS partners.

Key Abbreviations Used

SCRM—Supply Chain Risk Management
CVCM—Customer Value Chain Management
GSM—Global Supplier Management
GCRM—Global Component Risk Management
BCP—Business Continuity Planning
FRA—Financial Risk Assessment

For sustaining products, the team has developed a highly collaborative model with GSM and Manufacturing Operations, working closely together to define the resiliency programs that need to be executed. However, once these programs are scoped, it falls upon the GSM and Manufacturing Operations teams to do the heavy lifting by working with Cisco's component suppliers and EMS partners to implement the applicable resiliency program (for example, qualifying second sourcing and alternate sites and negotiating and implementing buffers).

In certain cases, design mandates are at odds with optimal supply chain resiliency. There can be some inherent risks in designing-in a product from a start-up supplier—a company that has no demonstrated ability to ramp, deploy a robust BCP, troubleshoot quality or maintain financial stability over time but provides required technology to differentiate product functionality. By designing a plan to mitigate against these elevated risks, SCRM enables the company to move forward, to adopt an innovative component it might not otherwise have had the risk tolerance to use.

Risk Management Program in Action

Cisco has hundreds of suppliers producing components at thousands of sites that feed its EMS partners around the world. With 95 percent of its production outsourced, Cisco's supply chain footprint is very global. To enable supply chain monitoring, the team first had to understand the footprint, or more specifically, where Cisco components were being built. To collect this critical information, the SCRM team developed the Business Continuity Planning (BCP) program, which collects key information required to perform a supply chain risk assessment, in addition to an effective crisis response. Data collected from suppliers include: physical address of supplier sites, emergency contacts, alternate manufacturing locations and time-to-recover to an alternate site. The continuity planning process also includes gathering data to evaluate a supplier site's own business continuity plans, or readiness and resiliency in the event of a supply chain disruption.

With the footprint defined, the SCRM organization was then ready to begin correlating world events to strategic locations on the map. The team utilizes NC4 (National Center for Crisis and Continuity Coordination), which allows it to build alert profiles based on specific locations or geographies. NC4 customers, such as Cisco, are then able to subscribe to alerts based on a set of filters for attributes including event severity and event type. In the case of Chengdu, the team was alerted based on the following NC4 profile: *Moderate to extreme meteorological and geophysical incidents within 100 miles of a supply chain location.*

This real-time monitoring, coupled with supply chain locations, provides the SCRM team near-immediate notification of incidents and greatly shortens the response time to events that are out of the team's control. In most cases, many companies are learning about impacts to their supply chains days or even weeks after incidents such as earthquakes and labor disputes occur.

In the case of the Chengdu earthquake, within 48 hours Cisco was able to conduct a full impact analysis, including evaluating affected supplier sites, parts and products. The robust BCP platform allowed the team to gain complete visibility into the supplier footprint in the area. Within two days of the earthquake, SCRM had initiated a crisis survey targeted at the suppliers' emergency contacts in the region. Meanwhile, the crisis team had partnered with affected Cisco organizations and reviewed any potential revenue impact.

The analysis performed within the first 24 hours of the earthquake revealed that Cisco had approximately 20 suppliers in the affected area. While there was no impact to any of the manufacturing sites and logistics centers, there were two suppliers potentially at risk: Supplier X, which presented a significant revenue expo-

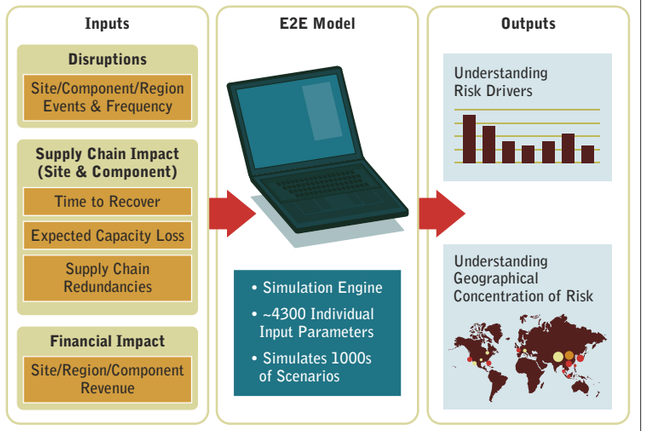
sure for Cisco in addition to the risk of being single sourced, and Supplier Y, with a smaller revenue impact but with physical damage to one of its buildings.

It turned out that the SCRM team, in conjunction with the Global Supplier Management function, had proactively been working to address the single-source risk with Supplier X and had already identified a second source a few months prior to the earthquake. However, the situation with Supplier Y remained an issue. A group within SCRM, the Crisis Management Team, engaged its internal sourcing, planning and operations colleagues to deploy previously identified second sourcing options as well as to gain commitments from the supplier for additional capacity.

Despite facing a natural disaster of huge proportions, Cisco was able to respond rapidly, ensure the safety of the extended supply chain, identify the risk exposure to the company and work with its EMS partners to mitigate the risk, thus ensuring no impact to customer shipments. The continuity planning, crisis management and risk mitigation arms of the SCRM team worked in close collaboration with internal partners in this endeavor.

EXHIBIT 1

Risk Engine



Source: AMR Research

Quantifying the Impact

Once the sites impacted by the earthquake in China were identified, we could quickly leverage and combine the BCP information with supply chain visibility data to determine any potential impact to Cisco's customer shipments or financial bottom line by quantifying the exposure. The BCP data provides time-to-recovery data for each of the supply chain locations, including raw material suppliers, logistics and transportation providers, and EMS partners. This includes visibility into which components, materials or products are produced at each supplier locations. In addition, the supply chain data allows us to determine which products and how much revenue is enabled by each of the logistics and EMS partner locations.

We are able to leverage these same analytical capabilities to develop supply chain risk assessments, helping Cisco focus on proactive risk mitigation programs with the right priorities. To accomplish this, Cisco uses a "risk engine" to assess the likelihood of a disruption. (See Exhibit 1.) The risk engine incorporates many data sets (such as 100-year flood data, actuary data, geological and geo-political data, site incident data, supplier performance data) to assess the likelihood of a disruption. These disruptions are correlated to Cisco supply chain locations including supplier sites, contract manufacturing facilities and logistics centers. The impact of a disruption is determined based on the revenue enabled by each node in the supply chain and that node's recovery time. Cisco also uses simulation capabilities to integrate all of these data sets into a single model that generates "heat maps" based on likelihood and impact. (Exhibit 2 depicts the mapping capabilities to assess supply chain nodes, which include suppliers, contract manufacturers, and strategic logistics centers, within the radius of an event.)

EXHIBIT 2

Mapping Capabilities to Assess Supply Chain Nodes

Mitigating Risk in the Supply Base

Supplier and component resiliency has always been core to Cisco; for this reason, the company takes a very proactive approach to ensuring that whenever possible its products have two or more sources qualified for each part. GSM and Product Operations have dedicated resources and funding to identify and "de-risk" single sourced and other risky components. Each part has a risk attribute that identifies its sourcing status (single vs. multi sourced), quality history, technology status (legacy vs. new) and lifecycle (new, end of life). These risk and other, component-level attributes provide design guidance for new products. A key function of component teams is to find and qualify alternate sources for the single-sourced parts. Where second sources cannot be found, Cisco has dedicated resources and funding to develop an alternate source for certain key components with very high impact to revenue.

Cisco launched the Global Component Risk Management (GCRM) program to formally streamline the efforts of the diverse groups engaging in risk mitigation efforts throughout the organization. The program prioritizes their efforts and provides a tool-based system to log history of risk mitigation efforts at the component level. It also provides the capability to track and manage progress and status of risk mitigation by different groups. This approach eliminates duplication of efforts, establishes clear ownership and target completion dates, and helps keep track of mitigation activities being pursued on thousands of components in one central repository.

A centrally coordinated program facilitates a quick and coordinated response to any crisis requiring component mitigation. For instance, when the economic downturn worsened at the end of 2008, Cisco was concerned about the financial well being of many of its core suppliers. The company quickly launched a Financial Risk Assessment (FRA) initiative to identify those suppliers with single-sourced parts that have high revenue implications for Cisco. In collaboration with the GSM and finance teams, Cisco quickly set up meetings with most of the privately held suppliers and select public ones. Once the financial assessment was complete, the team separated suppliers into three categories: "Green," requiring no action; "Yellow," needing to be monitored; and "Red," needing mitigation. If a supplier fell into the "Red" category the GCRM program was leveraged to quickly identify, prioritize and mitigate all the single-sourced parts that were purchased from affected suppliers.

This proactive approach proved timely. When two of the suppliers filed for bankruptcy protection, Cisco already had put in place "last time buys" and established second sources for their parts.

Mitigating Risk in Manufacturing Footprint

Going back to the Chengdu earthquake, based on the impact assessment, Cisco was able to quickly determine if there was any impact on manufacturing, transportation and/or logistics nodes. If there had been disruptions, our proactive risk mitigation program would have identified alternatives and ensured that they could have been enabled quickly through product qualifications and defined recovery plans that achieve the stated recovery time objectives.

In order to achieve mitigation, SCRM's Business Continuity Planning team, in conjunction with the applicable functional group (i.e., Global Supplier Management for suppliers, Manufacturing Operations for manufacturing partners) assesses the current recovery capabilities and identifies any gaps that could limit Cisco from recovering within the desired timeframe. These gaps form the basis of the mitigation program. Specifically, Cisco works with its EMS partners to close these gaps through developing work-around processes, reducing equipment lead times, and enabling quick ramp-up at the alternate facility.

The company ensures that whenever possible its products have two or more sources qualified for each part.

For example, to mitigate the risk around the EMS partner locations, Cisco looks at developing recovery plans with their partners, including agreements for additional capacity that we can leverage in the event of a disruption. The goal is to integrate risk requirements into the company's capacity planning processes. For test equipment with a lead time longer than the recovery objective, the Supply Chain Resiliency team in conjunction with the applicable test team will work with a supplier to determine the appropriate mitigation solution. These solutions can range from setting lead time agreements to purchasing inventory of long lead time materials and securing burst capacity to meet demand surges.

For logistics centers, the team works with the EMS partners to identify additional space and/or facilities that can be leveraged, including redundant warehouse pro-

cessing equipment. These proactive mitigation solutions and recovery plans became useful during the Chengdu earthquake. They allowed Cisco to leverage alternate transportation solutions, offer additional transportation capacity, and expedite capabilities to the impacted suppliers in the region.

The Silver Lining to Disruptions

Disruptions provide a unique opportunity to enhance your capabilities. While the core mission of any supply chain risk management program is to mitigate disruptions (if not avoid them altogether), there is a silver lining to even the most unfortunate occurrences. Process development, mitigation programs, and even drills will only tell you so much about your supply chain's readiness and responsiveness in the case of a disruption. The true test of supply chain resiliency comes in the face of events like the Chengdu earthquake. Even the most thoughtful and thorough crisis management program will not anticipate every aspect of a disruption. Moreover, disruptions tend to be idiosyncratic in nature—each taking on dimensions and requiring a different response tailored to that event. In the face of real disruptions, however, organizations are presented with unique opportunities to refine their programs.

When events do occur, it becomes clear very quickly whether your program has had the right focus and can respond with the required resiliency.

In the case of the Chengdu earthquake, Cisco learned several things about its own program and made appropriate changes. As a result of the event, Cisco revised the membership of its crisis management teams to include key external players like manufacturing and logistics partners and adjusted the activation process. The company also made its risk management playbooks and trigger points more forward looking and proactive based on the type of event. More importantly perhaps, we gained a fuller appreciation of the importance of having a closed-loop post-mortem process that allows the team to capture key lessons and evolve the program. Cisco understands that a program will never be "baked," but rather must be capable of incorporating useful learnings from new experiences.

Events also play an important role in ensuring ongoing senior management support, which as we discuss below is essential to a program's success. When events do occur, it becomes clear very quickly whether your program has had the right focus and can respond with the required resiliency. Provided that it can (if it can't, we recommend your risk manager gets his or her resume in order), the event provides an opportunity to move beyond a theoretical value proposition and demonstrate the program's real benefits. By creating a historical log of events and the benefits realized (and pain avoided) from the risk management program, the SCRM gains important business intelligence that is particularly valuable during the planning cycle. Moreover, this does not need to be a complicated process or calculation. By understanding the improvement in recovery time resulting from the program, you can very easily track avoided impacts to revenue, on-time shipment, and other critical business metrics.

Securing Senior Management Support

A SCRM program cannot function in a vacuum; it needs to be a top priority at the highest level and across the organization. Further, effective SCRM requires coordination across a wide range of corporate functions. Despite the overwhelming presence of persistent risk in supply chains, however, only 12 percent of companies report having a risk-resilient global supply chain, according to a survey conducted by the Aberdeen Group.[2]

Support for Cisco's program comes from the very top. CEO John Chambers and Angel Mendez, SVP of the Customer Value Chain Management organization, are staunch supporters and maintain an active role in promoting and driving ongoing attention to supply chain resiliency. Chambers is briefed quarterly and sees SCRM as an integral part of the corporation's risk profile. Mendez, too, has great passion around SCRM and has often found himself in areas where a crisis is going to develop. For example, he was in Hong Kong in the midst of severe typhoons last year. When the H1N1 flu virus broke out, guess where he was? In Mexico City, as part of a Cisco delegation meeting with the Mexican president!

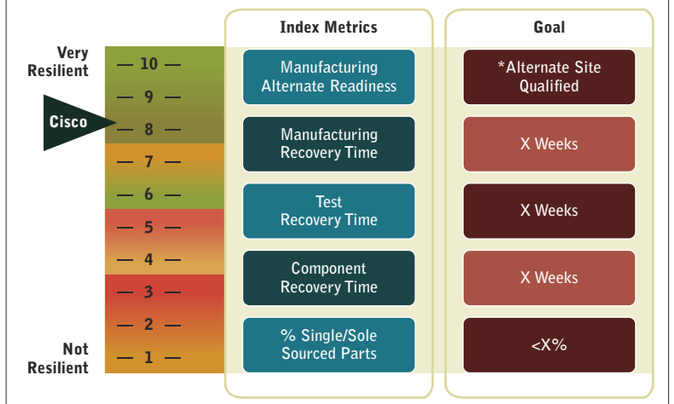
For Cisco, events like 9/11 and Hurricane Katrina were catalysts. Even though these events did not significantly impact Cisco, senior management saw the potential for disruption resulting from supply chain issues. Thus, the SCRM team was formed to proactively put in place infrastructure, processes, programs and tools to prevent, thwart and recover quickly from a major disruption.

Building resiliency can be an expensive proposition. After all, it's a highly complex undertaking. In Cisco's case it involves collecting BCP data from over 700 suppliers, identifying and qualifying second sources on thousands of single-sourced components, and building a crisis response capability that enables a coordinated response for more than 8,000 products. Dedicated funding is required, with a budget set aside each year with a clear set of objectives to be accomplished.

Finally, the team has developed metrics that enable Cisco to measure resiliency at the product, site, regional, geography and business unit level. (See Exhibit 3.) In particular, Cisco developed a "Resiliency Index," which is a composite of resiliency attributes that is calculated and reported by the business units at Cisco's semiannual operations review with senior management. By having a resiliency metric which is shared among the Business Units and supply chain, we have driven a common awareness and understanding of what resiliency means to Cisco as well as a common framework for driving improvements.

EXHIBIT 3

Resiliency Index-Sustaining Products



Source: AMR Research

Where to Start?

For a company looking to develop its own supply chain risk management program, our advice would be:

- Secure support from senior leadership within your company and especially the major stakeholders.
- Start with a basic business continuity planning program and build it out as a robust foundation to your risk management program.
- Effective crisis management requires coordination, playbooks and trigger points. So set up a cross-functional team and a timeline to flesh out a detailed playbook(s). Regularly update to reflect the realities of the crisis you are dealing with real-time.
- Develop clearly understood and accepted priorities for the resiliency and mitigation programs to facilitate decision making and action prioritization.

In this new globally connected economy, companies are facing an increasing array of risks. According to the World Economic Forum, "…the global risks landscape is a crowded one and the window of opportunity we have to address some of the greatest challenges of our time is narrow."[3] It is incumbent upon management to formulate and implement a SCRM strategy attuned to the needs of their markets and customers, with support and funding from the management team.

A successful risk management strategy will include a collaborative framework practiced across the organization and the larger external supply chain, supported by robust tools and comprehensive metrics. Importantly, it also will have a dynamic nature about it that allows the flexibility to evolve with the changing needs of the business. Successful risk management programs know how to strike the right balance between being completely unprepared and aiming for unaffordable (and unrealistic) resilience.

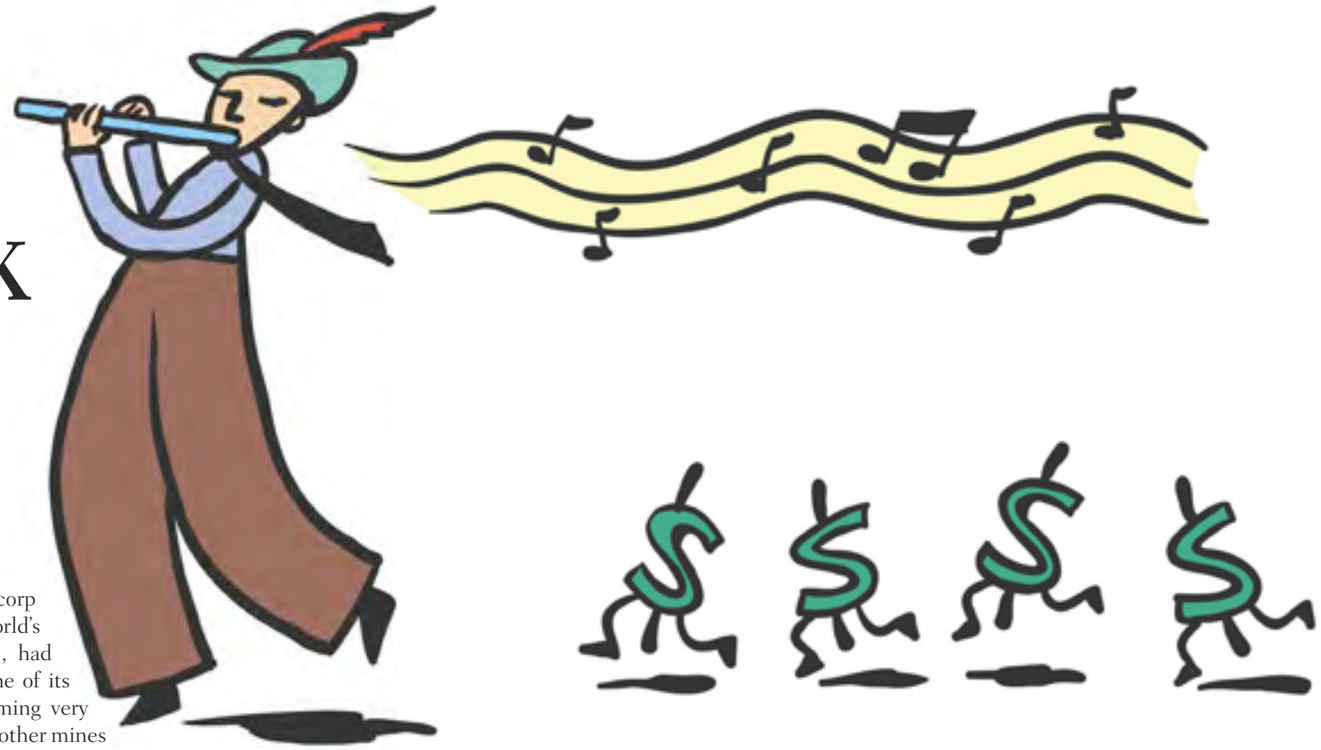
References:

1 "IBM Global Chief Supply Chain Officer Study: The Smarter Supply Chain of the Future" – February 2009.

2 Aberdeen Group Report – "Supply Chain Risk Management: Building a Resilient Global Supply Chain" – July 2008.

3 "Global Risk 2009" – A Global Risk Network Report from the World Economic Forum.

PROCUREMENT: The Missing Link in Innovation



By Corey Billington and François Jager

Procurement groups have a much greater role to play in helping their organizations to innovate. The internal driver is the compelling need for revenue growth—growth that can be propelled by stronger success rates in product innovation. The new role flows from the principles of open innovation and is made possible by the rapid emergence of Internet-facilitated "seeker-solver" networks.

A few years ago, Goldcorp Inc., one of the world's top gold producers, had a big problem. Some of its mines were performing very poorly compared to other mines in northwestern Ontario, Canada. After trying everything that his mining engineers knew, Goldcorp's CEO, Robert McEwen, made a very risky bet. He broadcast the entire geological data record of the company's Red Lake Mine, in effect triggering a new kind of gold rush. He offered $575,000 in prize money, with a top award of $105,000 to the person or company that would give Goldcorp an effective way to mine more gold.

McEwen's bet paid off handsomely. The broadcast of the challenge via the Internet—a novel approach in the year 2000—led to two Australian companies collaborating to come up with a three-dimensional depiction of the mine. The 3D graphical data produced an astonishing breakthrough at Red Lake. From annual production in 1996 of 53,000 ounces at a production cost of $360 an ounce, the mine was producing 504,000 ounces at a production cost of $59 an ounce by 2001.

Goldcorp had tried and succeeded with a markedly different type of procurement activity. The company had outsourced part of its engineering activity to a supplier—not one of its preferred or even its regular suppliers of goods and services but a supplier it hadn't known previously. The supplier team had identified itself and the service it would provide rather than being found and evaluated by Goldcorp's procurement group in the context of predetermined supplier criteria. Essentially, Goldcorp had not only broken with the idea of seeking innovation only from its own staff, but also had gone beyond looking "locally" for innovations from its established suppliers.[1]

Now that the Internet has greatly reduced the cost of acquiring knowledge and made it so much faster to do so, we expect such unconventional procurement activities to gather momentum. Indeed, we expect it to transform procurement's role in not only containing costs, but also in driving innovation and therefore top-line growth. Essentially, the new conditions call for a re-examination of the make-vs.-buy decision. The approach looks well beyond fixed relationships within a carefully screened "extended enterprise" to more one-off transactional relationships with organizations and even individuals with which there is rarely a pre-existing relationship. We urge supply management professionals to recognize that procurement processes lie at the root of much innovation activity. Further, we propose that the organization must provide the processes to enable and encourage such problem-solving relationships— processes that we call "seeker-solver networks." (For more on the seeker-solver concept, see accompanying sidebar.)

This marks a major shift from what even the best-in-class procurement groups are doing. Although there are quite a few informal efforts among leading companies and some impressive new structured problem-solving networks, we know of no instances of networks that formally involve procurement staff. It will be necessary, we believe, for procurement professionals to develop new ways to define and identify needs inside their organizations, to assess the capabilities of the organizations' internal resources to meet those needs, and to match them against all available external resources.

Innovation: A Growing Problem

Nowadays, CEOs are under more pressure than ever to accelerate revenue growth. To drive growth, they are looking for more innovation—and more productive innovation—particularly in products and services. Defining success criteria for R&D productivity is notoriously difficult. But CEOs realize that the great majority of their innovation investments fail to deliver lasting value. In 2005, the global 1000's top R&D spenders spent an average of 3.84 percent of sales on R&D[2]. But innovation productivity is dismal. Recent research shows that only 4.5 percent of innovation initiatives produce successful outcomes—defined as reaching predetermined return-on-investment (ROI) targets.[3]

Corey Billington is professor of operation management and procurement at IMD Business School in Lausanne, Switzerland. He can be reached at: corey.billington@imd.ch. François Jager (francois.jager@imd.ch) is a research associate at IMD.

In many industries, R&D expenses have gone up while the profitable outcomes of research have gone down. The pharmaceutical industry offers a typical example: Its declining R&D productivity has obliged executives to focus their resources on blockbuster drugs (drugs that will net more than $1 billion over their product lifecycles). The story is similar in many other sectors. As rising development costs combine with shorter product life cycles, executives have an increasingly difficult time justifying heavy R&D investments. In the automotive industry, for example, purchased parts costs account for around 80 percent of the cost of a car, on average. Not surprisingly, industry executives have looked to their suppliers for innovation in component designs, in quality processes and in manufacturing processes. Yet suppliers face the same type of challenges as their customers.

We expect the Internet to transform procurement's role in not only containing costs but in driving innovation and therefore top-line growth.

We have found that many R&D managers who try to utilize seeker-solver networks often make costly mistakes by poorly constructing their challenges. (In knowledge brokering parlance, a "challenge" is a question that seekers broadcast to potential solvers.) Either their challenges are too tightly defined, with inherent biases that lead them to the same dead ends, or their definitions are too loose to net any new answers. We have found both types of defects in our research. Too often, R&D managers are "reinventing the wheel" of procuring services, making expensive mistakes as a result or making very slow headway or losing process capability when managers retire or transition out of the R&D organization.

Collaborative Approaches to Innovation

Supporting evidence for the effectiveness of "procuring" solutions by finding them rather than creating them is found in research about knowledge brokering. The knowledge brokering cycle described by academics Andrew Hargadon and Robert Sutton[4]— capturing good ideas, keeping ideas alive, imagining new uses for old ideas and putting promising concepts to the test—has been well used for years by contract design firms such as IDEO and Frog Design. Their business model recognizes that knowledge is unevenly distributed and that reusing mature ideas in different contexts is more cost-effective than inventing the same ideas from scratch. Asking a supplier to invent on your behalf may be a little less expensive, but it's much faster and more cost-effective to find existing mature solutions and adapt those solutions to your challenge.

By itself, the concept of procurement helping reach outside their companies for innovation is not new. In the late 1980s and early 1990s, for example, Chrysler supply chain executive (and later president) Thomas Stallkamp achieved spectacular wins by developing collaborative partnerships with the automaker's supply base. Stallkamp's approach helped improve product quality and cost efficiencies at a time when other industry procurement executives stuck firmly to cost-squeezing "iron fist" relationships with their suppliers.

In recent years, the concept of "open innovation" has gained more currency, with companies looking not only at how they can bring innovation in from outside their firm but at how they can sell some of their unused "information assets"—such as patents and trademarks—to increase shareholder value. Henry Chesbrough, executive director of the Center for Open Innovation at the University of California, Berkeley's Haas School of Business, defines open innovation this way: "The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. This paradigm assumes that companies can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology."[5]

Lately, the Internet has added a powerful twist to the open innovation concept that can significantly reduce the cost of innovation, pairing corporations (seekers) with R&D challenges and external scientists (solvers) who can approach problems from many different angles. The core premise is not only that somebody "out there" may already have solved your problem (or has the wherewithal to do so easily) and is willing to do so for a fraction of what it would take to replicate the solution in-house, but that they can be found and contacted quickly and efficiently via the Internet and that the transfer of intellectual assets is safe and secure. (See Exhibit 1.) The premise has tremendous appeal to open-minded organizations.

One striking example is InnoCentive, launched in 2001 by Eli Lilly.[6] Seekers, who are nearly always corporations, pay an annual fee of $100,000 to access the network; InnoCentive gets a percentage of the bounty paid to the solvers. The fast-growing network of solvers was approaching 130,000 by mid-2007.

Ed Melcarek, an InnoCentive solver, was able to answer an interesting challenge: finding a more efficient way for getting toothpaste ingredients into a tube. The Canadian engineer's solution suggested putting a positive charge on fluoride powder, then grounding the tube. Colgate-Palmolive, the InnoCentive client that reportedly posted the problem, liked the idea, according to Melcarek. He earned $25,000 for a few days of work. "It's a beautiful way of doing business," he said.[7] Colgate-Palmolive's returns were good, too, compared to what the company might have spent to achieve the same solution using traditional R&D approaches.

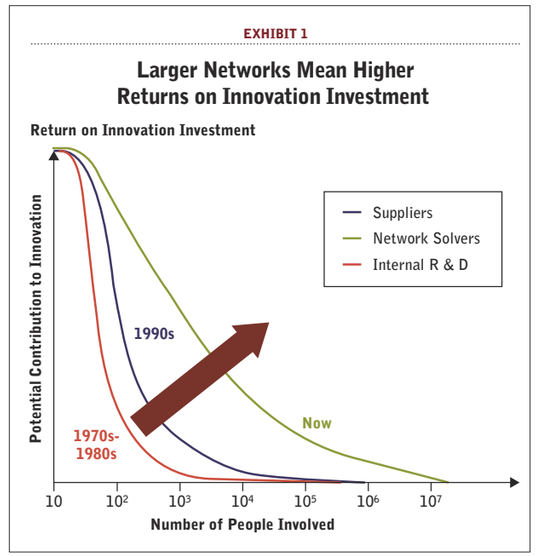
Nine Sigma uses a similar operating model, but its knowledge exchange focuses on the management of innovation. Launched in 2000, Nine Sigma says its mission is "to work on behalf of its clients to source innovative ideas, technologies, products and services from outside their organization quickly and effectively by connecting them to the best innovators from around the world." By mid-2007, Nine Sigma's network of expert solvers had expanded to 1.5 million globally. This network is made up of scientists, university research departments, and technology incubators.

The obvious benefit of such networks is that they can make it far cheaper and more effective to tap volunteers or low-paid hobbyists to resolve what once were seen as specialized technical issues soluble only by R&D departments. However, for all of their apparent benefits, there is a persistent limitation to many open-innovation structures—even to the Internet-enabled networks such as InnoCentive. They do not yet actively engage the procurement professionals whose job it is to help define make-or-buy parameters and support decisions accordingly. Although the process of managing the "inflows and outflows of knowledge" should sound familiar to any supply management organization (managing the interface with external suppliers is, after all, one of the function's primary roles), it is often not part of procurement's charter. We contend that supply management professionals will have to become more proactive at managing these sources of innovation.

To begin with, supply chain managers and procurement chiefs in particular have to be seen—and to see themselves—as "drivers of revenue through innovation."

EXHIBIT 1

Larger Networks Mean Higher Returns on Innovation Investment



Up Against Real-World Barriers

There is no shortage of reasons why procurement organizations do not traffic in innovation ideas. For a start, the vast majority are still rewarded for and therefore focused on cost savings. Talk to most procurement heads today about other ways for their groups to contribute and they will quickly point out that their metrics first need to change from price reduction to revenue generation. At the same time, purchasing managers are only now starting to see their roles in broader value-based terms, and as such they are just beginning to explore the possibilities of contributing to top-line growth. Not surprisingly, C-suite executives still mostly view procurement as cost cutters, not catalysts for growth. A vicious cycle is at work: The longer that procurement is seen as a support function, the fewer chances its professionals have to acquire and demonstrate new ideas, much less sell those ideas to the organization.

Corporate silos compound the problem. Communications do not flow naturally between departments; unfortunately, information hoarding is often more

prevalent than truly open and collaborative information sharing. And rightly or wrongly, R&D managers typically have developed their processes for acquiring innovation without support from other departments. Thus, they are unlikely to welcome unsolicited approaches from the procurement organization. Also, R&D communities have many of the same fears about outsourcing that manufacturing communities had in the 1980s.

For its part, the typical procurement organization has too much work to do, too many suppliers to support, and too few staff to do it all with. It is unrealistic to expect any hard-working procurement group to reach out to support their colleagues in R&D without change-making intervention by senior business leaders or without a clear and widely shared incentive to do so.

Add to these hurdles the inertia of the average Fortune 1000 organization and the persistence of compensation schemes and other incentive mechanisms that reinforce existing and often outdated business practices and it soon becomes clear that new ways of innovating—Internet-driven methods that actively involve procurement departments—are not easy to achieve.

Defining the Seeker-Solver Network

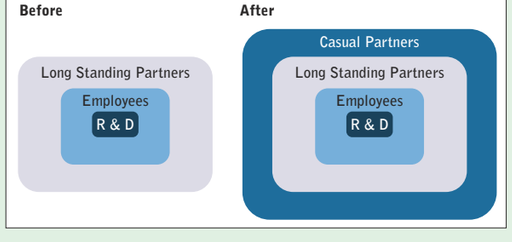
A "seeker-solver network" is an informal collection of people or companies that facilitates a productive working relationship between two previously unconnected parties, usually on a one-time basis. (Exhibit 2 offers a graphic description, contrasting it to traditional practice.) The Internet provides the facilitation mechanism to link a problem presented by one person or organization (the "seeker") with the myriad people worldwide ("solvers") who are have the skills and time to consider the problem and resolve it. Usually, the seeker offers prize money as an incentive.

In essence, a seeker-solver network is a procurement structure enabled by the Internet. Such networks are becoming useful because they are significantly less expensive than conventional mechanisms for developing and procuring innovation solutions. A recent pharmaceutical industry study found that a seeker-solver network can be more than 20 times less expensive than regular R&D paths.[9] Investigators carefully studied 12 challenges and found that the gross value created was $10.3 million—a 2,600 percent return on investments that comprised $333,500 in prizes awarded to solvers and total internal costs of $60,000.

Critics allege that seeker-solver mechanisms do not always work. But the cost of unsuccessful challenges is zero or at least significantly less than the cost of a failed internal R&D effort.

EXHIBIT 2

R&D Before and After Seeker-Solver Networks



Toward a More Robust Solution

Those barriers notwithstanding, we believe there is much that procurement professionals can do to help drive innovation from the outside in. However, before we describe specific steps that should be taken, it is important to address a few of the preconditions for success that procurement can influence (but not control) and that other corporate functions can help with.

To begin with, supply chain managers and procurement chiefs in particular have to be seen—and to see themselves—as "drivers of revenue through innovation." Of course, it will help if they start acting accordingly. But in most organizations, senior executives will need to sponsor the new approach to innovation, fostering links between procurement and R&D as well as with human resources (HR) departments. HR plays a key role because performance metrics must be adapted to suit the changes. HR also can help employees cope with the cultural fears associated with the procurement of ideas while creating new measures that recognize procurement's contributions to revenue growth rather than price take-down.

Another aspect that is likely to require input from other departments is control over the company's intellectual property (IP). Procurement managers are quite used to ensuring that they have "bulletproof" processes for controlling IP transfer in their conventional contracts with suppliers. Even though the challenges on seeker-solver networks are posted anonymously, some managers fear that industry insiders can deduce which challenges are theirs, thus signaling the competition about their actual R&D objectives and approaches. This issue can be addressed by "thinly slicing" challenges—that is, constructing them in such a way that they do not disclose the strategy or the commercial intent behind the challenge. The company's legal counsel may be able to help to define challenges specifically enough while making sure that any unnecessary information is not exposed to the world. In other words, procurement managers are likely to need some assistance to learn the art of "hiding in plain sight."

First Steps for Accelerating Innovation

Companies that want to harness the full power of seeker-solver networks must ensure that their procurement professionals make rapid progress on three fronts:

1. Launch Multiple Experiments

Procurement managers need to adopt an experimental mindset in order to make the most effective use of such networks. A good starting point is to create a few pilot programs in which real business problems— albeit not necessarily mission-critical challenges—are posted on an existing network such as InnoCentive. (Ideally, the experiments should be tried on different networks to better understand the unique characteristics of each.) In essence, procurement leaders should be including real seeker-solver networks in their toolboxes.

It is important to begin with a low profile and to avoid overselling the concept to senior management. The experiments should be in different topic areas and should reflect different conditions if the procurement teams are to gain a comprehensive understanding of what seeker-solver networks are all about. In such experimental phases, the procurement teams, together with appropriate R&D staff, must learn how to properly subdivide an R&D problem and then how to properly frame a challenge for solvers, using the right terms and offering solvers appropriate incentives. They also have to master the skills needed to capture, sort, analyze, manage, and respond to the responses.

One InnoCentive user, Dow AgroSciences, gives a glimpse of a typical approach. "The approach was a bit ad hoc at first, but we learned quickly that we needed to put some structure around it and help drive it," says Dan Kittle, the company's vice president of R&D. He points out that you need to condense a seeker-solver challenge down to a problem for which the seeker rationally believes there is available expertise, understanding, and capability in the "outside" world. "You don't want to put all of your recalcitrant challenges out there," explains Kittle, "Because that doesn't offer the greatest opportunity, and not all problems fit InnoCentive."[8]

2. Track Results and Build Bridges

Once procurement managers are alert to all the external networks available and after they have launched their seeker-solver experiments, they should document and track every experiment and discuss and absorb its lessons. The experiments should be gauged in terms of the costs of the solutions developed, the interest levels of potential solvers, the numbers of solutions they offer, the actual success rates, and eventually the returns on investment. From an internal perspective, if procurement managers are to become active solution seekers, they will have to be proactive at creating "wish lists" by interacting with different departments—with R&D in particular. Then they will need to be prompt and efficient at delivering proposed solutions. Procurement and R&D heads will have to create bridges between their respective departments, enabling a trusting atmosphere and ensuring that bench scientists remain supportive and don't feel threatened.

"We have to get over our reluctance to use the skills of outsiders: outside R&D, outside the company, and even outside our industry."

3. Lay Foundations of an "Innovation Culture"

Eventually, all of these early seeker-solver projects should be assembled under a larger "change" program. The head of the procurement organization can provide process leadership and prove cost effectiveness, but corporate behavioral change on such a scale is likely to require C-level support. As such, C-level management—probably the CEO or chief operating officer—must appoint an innovation process champion who will take the learnings from the experiments far beyond defined R&D and procurement initiatives so that they become part of a new corporate innovation culture. That means that the "make-buy" decision processes typical in, say, engineering departments, will have to be modified and adapted to an open innovation context. We expect that seeker-solver networks will evolve in many areas other than R&D. For example, marketing may choose to have selected brand tasks performed by "solvers" identified by evolving networks. IT will likely experience more development tasks procured from outside "solvers."

At the same time, the procurement group's met-

rics will have to be expanded to accommodate the new innovation tasks. Clearly, seeker-solver approaches will flourish in environments where managers are unafraid to experiment and where they may even be rewarded for taking measured risks.

Procurement's New Obligation

Our goal for this article was to show that procurement now has a much broader and more valuable role to play. The department best known for containing costs with a predetermined array of suppliers is now in prime position to accelerate innovation and thus drive the organization's top-line growth. Two factors make it so: the growing acceptance of the principle of open innovation and the recent emergence of Internet-enabled seeker-solver networks.

There is no shortage of reasons why procurement organizations do not traffic in innovation ideas. For a start, the vast majority are still rewarded for and therefore focused on cost savings.

Indeed, we would argue that fostering innovation is now procurement's new obligation and that one day, the procurement group will be judged on its ability to add value in this way. Without the active process support of the procurement organization, companies are at risk of having uncompetitive innovation processes. Because of procurement's skills and competencies in outsourcing and supplier management, CPOs need to be at the forefront of refining these competencies to provide the process guidance necessary to manage knowledge exchange through seeker-solver networks.

The procurement groups that are most ready to fill this new role are those where there is already a healthy respect for the groups' existing roles, where the corporate culture has adopted an experimental mindset, and where seeker-solver networks are viewed as a new value-adding capability. Companies such as Hewlett-Packard, Harley-Davidson, Dow AgroSciences, Colgate-Palmolive, and Procter & Gamble are making the right moves. Trailblazers like the auto industry's Tom Stallkamp long ago showed that it is possible to break with conventional procurement approaches. It is now up to procurement executives to make sure their companies can and do accelerate their innovation performance.

Many questions surface, of course. What response rates from solvers constitute successful "returns" from challenges posted on seeker-solver networks? What does it take to manage the interactions with unknown solvers? How can procurement best reach out to and add value for R&D groups? How can R&D groups get better at asking "make-buy" questions—and how can procurement groups get better at helping them to do so?

Despite such open questions, we firmly believe that the procurement organization has the best match of skills to allow open innovation to be done cost-effectively. We are confident that it will happen. As universities increasingly teach open-innovation concepts, we expect procurement's new recruits to have the skills to implement the necessary changes. Once open innovation is understood at every level of the organization, procurement groups will be better placed to acquire and assign the resources to take on their new roles. And with the steady escalation of procurement's status come the conditions that will enable procurement to significantly influence revenue growth.

This article reflects our insights and longtime industry experiences, but it is not the result of any extensive research program and certainly is not intended as a detailed blueprint for change. However, it is a topic of intense interest and one that we feel holds enormous potential. As such, we will be continuing to develop our argument and we welcome managers' shared experiences, comments and questions—whether or not they have yet embraced open innovation or begun to explore seeker-solver networks.

Sources:

1 For another perspective on the Goldcorp story, see *Wikinomics: How Mass Collaboration Changes Everything*, by Don Tapscott, Portfolio Hardcover (December 28, 2006).

2 "Smart Spenders, The Innovation 1000", *Booz Allen Hamilton*.

3 Larry Keeley, Doblin Group.

4 "Innovation Factory, *Harvard Business Review*, May-June 2000.

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8 *Chemical and Engineering News*, June 26, 2006 Volume 84, Number 26 pp. 24-25.

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CHAMPION OF GREEN

An Interview with Drew Schramm

Go to any industry event these days and you're almost guaranteed to find one topic prominently featured on the agenda—*green*. But as often as not, you get the feeling there's still a lot more talk around the subject than real action.

That's not the case at Herman Miller Inc., a $2 billion contract furniture manufacturer based in Zeeland, Michigan. Herman Miller has been in the forefront of good environmental and sustainability practices even before these terms became commonplace—all the way back to the company's founding in the 1920s. In more recent years, this commitment has been reflected in a host of recognitions and awards, ranging from a White House Presidential Citation for Environmental Management in 1991 to a 2007 Wastewise Golden Achievement Award for Smart Packaging.

That commitment also is reflected in Herman Miller's approach to supply chain management. The person responsible for that function is W. Drew Schramm, senior vice president of global supply and logistics. Schramm and his team work to ensure that every action taken in connection with acquiring and moving components and finished products worldwide conforms to one of Herman Miller's core values, "to be a good corporate steward for the environment."

Schramm is not only a believer in the gospel of environmental sustainability, but also an energetic evangelist. He's a frequent participant in industry forums on the topic and is active in the Institute for Supply Management's (ISM) Committee on Sustainability and Social Responsibility. Schramm also gives freely of his time to fellow supply chain professionals seeking to advance the sustainability cause in their own organizations.

SCMR Editor Francis Quinn spoke with Schramm recently about supply chain sustainability and social responsibility at Herman Miller.

Photos by Glenn Triest

Q: *As the senior vice president of global supply and logistics at Herman Miller, what are your key responsibilities?*

A: As my boss puts it, if it moves anywhere or if anybody buys it, I'm held accountable for it. So I literally have responsibility for all of the suppliers, whether they're on the MRO side or on the raw materials side, as well as all logistics and transportation activities.

Q: *What's the geographic scope of these responsibilities?*

A: There are four geographic regions that I need to make sure stay connected and optimized. The biggest is here in the United States. The second largest is in the U.K., which services our European operations. We also have entities in China and Brazil.

Q: *How do you view the function of a supply management organization?*

A: I don't view our primary mission as cost savers. We are waste eliminators. That means we are constantly looking at waste in the value stream and how we can reduce it. If we viewed our job as purely cost reduction, we would sacrifice a lot of things—including our suppliers' margins. So the fact that we're constantly trying to find out where the waste is in the value stream allows us to concentrate on increasing that value. That helps not only my supplier, but my customer and my company. But moving supply management and purchasing from cost reduction to waste elimination is a huge philosophical switch.

Q: *Turning to the main focus of our discussion, how do you define sustainability at Herman Miller?*

A: When we think about sustainability, we basically ask what are we doing today that will affect tomorrow. And if we're going to do something that negatively affects tomorrow just to make a short-term gain today, that's probably not sustainable and probably not what we should be doing. Now, in reality we need to keep in mind the other piece of the sustainability equation: we can't be good for the earth if we're not able to stay in business. So the other side of that sustainability coin is that we have to be financially solvent.

For example, moving from fiberglass to non-fiberglass materials in furniture panels would probably be better for the environment, better for the customer, better for everybody. But some customers may not be willing to pay for the added expense of a non-fiberglass product. So we have to seriously balance that against the competitive odds of us being sustainable in the marketplace, and maybe that means we have to wait on advancement in materials or a change in cost or market dynamics before we can implement some environmental actions.

Q: *Do you view supply chain sustainability as part of a broader corporate sustainability?*

We're betting that in the future customers are going to gravitate towards companies that are more mindful of sustainability practices.

A: When we get down to the level of the supply chain, we really view it as a combination of what we call sustainability and social responsibility. So it's what we are doing that can impact the community both from an environmental perspective and a people perspective. We wrap that up into a set of aspirations inside of my organization; we have specific goals for environmental improvements as well as community-oriented goals such as increased business with diverse suppliers.

Q: *Herman Miller's broad vision for sustainability is laid out in your Perfect Vision 2020 plan (see accompanying sidebar). Could you talk about some of the specific goals for 2020 and why you as a company felt it was important to articulate a vision that far out.*

A: Herman Miller is unique in that the founding family thought sustainability was important. We didn't wake up one day and say, hey, let's go green. That's why we're well along the path of looking at longer-range targets because we've been doing it for quite some time. Just in the last 10 years or so, we've gotten very serious about articulating this philosophy in terms of well-defined strategies rather than simply stating that this is part of our corporate credo. In essence, sustainability has been woven into the fabric of our future goals.

Throughout our history, we've been ahead of the curve. The design for the environment (DfE) approach that we have embraced is a manifestation of that. When we came out with the Aeron chair, for example, it was an innovative and thought-changing product. But it took a while for people's reaction to change from, "this chair is a little weird" to "it's really cool." In any case, we're on a strong innovative track around our environmental policies. In fact, we're betting that in the future customers are going to gravitate towards companies that are more mindful of sustainability practices.

Five years ago, I don't think there was a customer willing to pay a penny more for a product just because it didn't have PVC in it. Nowadays, we see more and more RFPs and RFQs coming from our customer base that are asking about reduction in the use of PVC, about environmental issues, about diversity, about what we're doing around recycling, and so on. So we feel even more strongly about the bets we made early on towards hitting our 2020 goals, or the "perfect vision." We think the tipping point on sustainability is coming soon—the point at which we really have no choice.

Q: *You mentioned something called design for the environment. Could you briefly explain that concept and the role that the supply chain organization plays in it.*

A: By way of background, one problem we have is that everybody and his brother seems to have a different idea of what should be measured, and how to go about it, and what counts for a sustainable product and what doesn't count, and how many points you get for it. So a long time ago, we started using the McDonough Braungart Design Chemistry (MBDC) certification process, which is a "cradle-to-cradle" protocol for designing your products in such a way that they're better for the environment. For us it's really all about chemistry and about critical questions like are the parts recyclable, are they easily disassembled, do they come from recycled material?

Now I have to tell you, as much as I love to stick with just the design for environment protocol—which makes things much easier for my team and for my suppliers—there are new outside influences coming down the pike that we need to be aware of. Perhaps the biggest of these is carbon footprint. Currently, that's not part of the MBDC protocol.

Q: *So the supply chain folks at Herman Miller are intimately involved in the design for the environment process from the beginning?*

A: Absolutely. That's at the heart of the goals we set, the processes we implement, and the relationships we develop with suppliers. This is especially true with new product development. The suppliers that have been with us for a while understand the MBDC process and know the importance of recycled content and easy disassembly and whether the material is green, yellow, or red. (Herman Miller's classification system of chemicals with little or no hazard, low to moderate hazard, and high hazard respectively.) They know from the beginning that they can't come to us with something that has PVC or chromate, for example. They're becoming pre-programmed to offer us solutions that will help us achieve our design for environment standards. That saves us time and it saves them time.

Getting to this stage with suppliers is not an easy process. It's time-consuming and there's a lot of hard work and data gathering—and a lot of negotiation. There are plenty of frustrations, too. But we definitely are making steady progress with all of our suppliers.

Q: *What about new suppliers?*

A: When a new supplier comes on board, we concentrate on bringing them up to speed on how to deal with us from an environmental standpoint.

Q: *You've made great progress with your suppliers on sustainability issues. Are you working with your customers toward the same goals?*

A: You can only push a customer so far. You've got to be wary of getting the cart a little in front of the horse because we're building a sustainable approach that not all customers can appreciate yet. In those cases where customers do appreciate what we're trying to do, they gravitate towards us very quickly. For instance, those industries that are in front of the public eye—the investment houses, banks, insurance companies, for example—tend to be more conscious about buying from a Herman Miller because of our record and reputation for keeping things green. Why? Because their customers are saying, I'm keeping my money in your trust, and I want to make sure you're a trustworthy person. And if you're doing something good for the environment, that increases my level of trust with you.

Now do we try to educate customers as well when we have the chance? Absolutely. But sometimes that means saying to the customer, we can give you formaldehyde-free product, but it's going to cost a little bit more. They might respond, I'm not willing to pay a little bit more and a formaldehyde board is fine with me. So that's what we give them. Now is that doing something particularly good for the environment? Probably not. But that's that second side of the sustainability coin—staying in business.

Herman Miller's 2020 "Perfect Vision"

- Zero landfill.
- Zero hazardous waste generation.
- Zero air and water emissions from manufacturing.
- 100 percent green energy.
- All buildings constructed to a minimum LEED Silver certification.
- 100% of sales generated from products that meet the DfE protocol.

Q: *Do you find that the segment of customers who are interested in working with you on sustainability is expanding significantly?*

A: The growth is becoming logarithmic. It's accelerated by things like the CARB (California Air Resources Board) standards in California, which among other things is going to limit the use of formaldehyde in wood panels. That's going to affect every company doing business in the state. Companies like Herman Miller will not have a choice. Neither will the customers. So when you see this kind of legislation being passed, you can appreciate that the curve is accelerating on a logarithmic scale.

What's happening in the European Union and the U.K. will also accelerate the trend. The EU, for example, has implemented new regulations on the safe use of chemicals under a program called REACH. Members of the EU are very conscious about the kinds of materials they're bringing into their country. They're refusing to allow in anything negative or harmful that possibly could end up in a landfill and pollute their water or land. That's going to eventually hit the United States.

Q: *How do you get the people in the Herman Miller organization to buy into the sustainability message?*

A: It starts right at the top. Our CEO Brian Walker has publicly declared that 50 percent of our product sales will be DfE certified by 2010, and that goal is incorporated into my performance objectives and those of my people. That goes a long way toward getting the message across.

Another important factor is that sustainability is really part of the DNA here. That's what makes working at Herman Miller so pleasurable. A simple indication of that is our employee parking lot. I can almost guarantee that you'll never see any kind of waste or debris out there. Our people are educated to understand that debris runs into the waste water, which then can pollute everything else. And when you go into our cafeterias, you see people separating all of their recyclables on their own. Again, that's because we've taken the time to educate people on why recycling is important to our community, why it's important to our customers, why it should be important to our families. And, of course, that culture tends to attract like-minded people.

Q: *Obviously, Herman Miller is fortunate to have leadership committed to sustainability and green. What about your fellow supply chain professionals who may be in an organization without that same kind of commitment at the top? What can they do to get the sustainability ball rolling?*

A: They can do a lot. Here's a good example: I'm on the Committee on Sustainability and Social Responsibility at ISM (Institute for Supply Management). We have a diverse group of companies represented on the committee including the heads of purchasing from IBM, Motorola, one of the children's hospitals, the Disney organization. There's even a representative from the New York Mets. We've been working to gather as much knowledge as we can on sustainability and responsibility and make it available on the internet to supply management professionals. They can simply go to the ISM web site (www.ism.ws) and click on the box for "Ethics and Social Responsibility." It's a wonderful resource that includes case studies and step-by-step guidance on how to make an organization more sustainable. They don't have to wait for their CEO to tell them what to do.

We at Herman Miller don't have it all figured out. We just may be half a step ahead of some other people.

My other idea comes from Steven Covey's book *Seven Habits of Highly Effective People*. Covey writes about what he calls the circle of concern and the circle of influence. The circle of concern relates to the things we all worry about, but really can't do much about. What's happening to the dollar on the global markets is a good example. The circle of influence, on the other hand, involves things you can do something about. So if you want to start along the part of sustainability without your CEO's involvement, stick with what's in your circle of influence. As a supply management person, can I affect my suppliers? You're darn right I can. Can I start asking my suppliers what they are doing around the environment? And, oh by the way, can I start measuring their adherence to environmental standards we have set? Simple steps like these that are well within your circle of influence can start the ball rolling.

Q: *Sounds pretty doable.*

A: Right. It doesn't have to be some big, sophisticated, gazillion dollar IT deal to get it done. It could be as simple as a spreadsheet you send to your suppliers and update every few months when you get together.

Q: *You talk to industry groups about balancing green with "getting the green"—the business aspect of sustainability. How does that play out at Herman Miller?*

A: Well, it takes a lot of work. Let me give you an example. In the yoke of our Mirra chair we initially had plastic surrounding a hunk of metal to make the back of the chair stiff. When the prototypes were done and our design for the environment gods came down and looked at it, they said we're not going to give you points because the yoke could not be disassembled quickly in 30 seconds with hand tools. So that forced my team to go back to the suppliers and work on alternative solutions with their engineering group. Turns out, after being required to spend a little more time on the design, they came up with a better solution that was all plastic, therefore highly recyclable. And since it was all one material, you didn't have to disassemble it. Plus, it was actually cheaper! But again, it takes more work to go back and try to find those solutions.

All of this requires your people to be much better thinkers and problem solvers. That, in turn, brings more value to the company.

Q: *From a supply chain management standpoint, are there certain sustainability achievements you're particularly proud of?*

A: I would boil them all down to one: the ability of our new product development team to work with our suppliers. This capability enables us to get to market with our green product much faster than constantly having to go back and reengineer everything to get it greener. Our suppliers are already thinking green from

the beginning. That means we start with the clear understanding that certain approved resins are better than others, that chromium-free leathers are preferred, that we polish material instead of chromate, and so on. So all of the work we've done over the last four years is now paying off. We can move much faster because our suppliers exactly know our expectations and already have a great knowledge base of what raw materials we can use.

Q: *What have you done in the area of packaging specifically?*

A: We have done a heavy amount of work on reusable packaging. In some cases, we've even eliminated the packaging. So instead of putting the furniture in boxes, for example, we blanket-wrap them in dedicated trailers. The customer unloads the furniture and returns the blankets to us; there's no box or other packaging to be disposed of or recycled.

Q: *Herman Miller has been widely recognized for your green initiatives. How does the organization react to the accolades?*

A: Historically, we had been modest in publicizing awards and didn't talk about them too much. Now, I'm originally from New Jersey, so maybe I'm a little different from the typical Herman Miller person. But the last thing a Herman Miller person would want to do is blow their horn about an award we received. But that's changed in recent years, and now we're willing to step up and be recognized for our leadership in places like *Fast Company* magazine, or the *Harvard Business Review*, or even *Vanity Fair*. Our culture is to be quiet about those things and put our heads down and really accomplish the right thing rather than say we're accomplishing something, but now we're more supportive of seeing those results publicized and hopefully encourage others on the same journey.

Q: *Looking out over the near term, what do you see as the biggest challenges to becoming more sustainable?*

A: The first challenge centers on standards. At present, there's a plethora of existing and proposed standards. There's the MBDC protocols I mentioned earlier. There are the LEED green building standards. Plus there are the BIFMA safety and performance standards for the furniture industry. And that's not all of them. There's an alphabet soup of standards out there. Which ones do we want to hang our hat on? There's nothing more devastating to my team than running in 15 different directions trying to respond to different standards rather than narrowing our focus on a few right ones. We need to know which standards will govern what we do so that I can get my team behind those standards and drive our behaviors and our metrics accordingly.

Another challenge that scares us is around the carbon footprint. Right now, there's a lot of talk about it, but no substantial measurement capabilities or metrics. How is it measured? How do you offset it? Am I carbon neutral, say, if I create a million tons of carbon but buy a million trees? These are all gray areas that are going to take a considerable amount of work to clarify.

Third is the data. The data is just going to kill us all in the purchasing world because customers are going to say: Hey, I want to buy that chair. Can you tell me exactly what the carbon content is, how much can be recycled, what percent is recycled, how many dollars of diverse content went into it? We're going to have to get that granularity into our systems. Our suppliers will need the capability to provide us the data that will go right into our systems. Our salespeople must be able to effectively pull that data to answer our customers' questions.

Those three things scare the ever-loving daylights out of me. And that's when I start longing for the days of old when it was three bids and a cloud of dust—and all I cared about was cost.

Q: *How can supply chain people reading this interview become more knowledgeable about sustainability issues?*

A: I was fortunate enough to come to a company that is very proactive around the environment, which obviously quickly raised my own knowledge level. So to the extent that it's feasible to an individual, one recommendation would be to search out a company that's committed to sustainability. Another idea is to bring in outside consultants or experts who can educate you and your organization on the importance of these issues. Then there's the ISM web site that I referred to earlier. It truly contains a wealth on information on the subject.

One point I need to emphasize, though: We at Herman Miller don't have it all figured out. We just may be half a step ahead of some other people. So when I'm talking to groups or individuals, I tell them there may be other, better ways to become more sustainable and socially responsible than what we're doing here. But from listening to me, I hope that they will start thinking seriously about how to get started, what questions to ask, what metrics to put in place. Bottom line: It ain't rocket science, it's just hard work.

How to SUCCEED with Supply Chain Planning

By Clarence Chen and Nirmal Hasan

Clarence Chen (cchen03@prtm.com) is a principal and Nirmal Hasan (nhasan@prtm.com) is a manager at PRTM Management Consultants.

Advanced planning and scheduling (APS) solutions are supposed to solve the big supply chain problems of flexibility and responsiveness—and they can do so. But first companies have to navigate through three "valleys of despair" that bedevil and can derail an APS deployment. Here's how to identify those crisis points, minimize their impact, and ultimately persevere for supply chain planning success.

When products such as mobile phones can become obsolete in less time than it takes the supply chain to move them from drawing board to store shelf, it is clear that producers cannot succeed unless they plan and execute their supply chain operations with great precision, speed, and flexibility. In such cases—and they are increasingly typical—there is almost no margin of error for big shifts in demand, let alone for serious supply chain disruptions.

Yesterday's sequential, inflexible manufacturing resource planning tools have long since ceased to be effective for managing supply chains of any size or complexity. They have given way to advanced planning and scheduling (APS) solutions whose sophisticated algorithms can ensure that raw materials and production capacity are optimally allocated to meet demand.

Designed to address complex trade-offs between competing priorities—between meeting a tight delivery window or adding a shift, say—APS tools have existed as a distinct class of applications for more than 10 years. They are offered by best-of-breed vendors as well as by the enterprise resource planning (ERP) giants such as Oracle and SAP. They are purchased by almost all mid-sized and large manufacturers. Implementations take from nine to more than 18 months, and then require more time for the business to start seeing the benefits.

APS solutions pave the way for broad operational changes such as sales and operations planning (S&OP) or lean supply chain initiatives. When properly deployed, APS can improve supply chain operations significantly, as gauged by traditional measures such as inventory and customer delivery performance. One electronics company, for instance, found that with APS, it could respond to customer order demand and determine the impact on the supply chain in a matter of minutes versus the previous response in a week. On-time delivery improved as much as 15 percent as a result.

But the key word here is "properly." APS deployments have often garnered negative publicity for their failures, and many more failures no doubt remain undisclosed. In our experience, most companies are likely to encounter a set of common challenges regardless of whether they are considering APS solutions for the first time, extending them, or re-implementing them (and even though they may have ample assistance from a vendor or a systems integrator). In this article, we describe the peaks and valleys of typical APS deployments and identify effective strategies for anticipating and tackling these common challenges. In addition, an accompanying sidebar spotlights a company that successfully rolled out an APS solution in only six months.

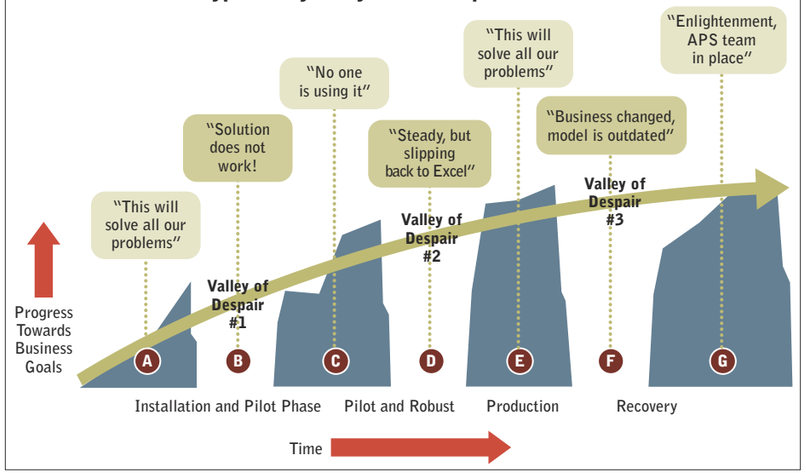
Mapping the "Valleys of Despair"

APS deployments typically follow a well-defined pattern, with predictable periods of difficulty that we call the three "valleys of despair" (See Exhibit 1). Minimizing those valleys and maintaining the momentum of the deployments are the keys to ensuring that the solution ultimately delivers the intended benefits.

The first crisis usually surfaces right after the design phase. The second occurs in the period immediately before and after the go-live event. The third emerges

EXHIBIT 1

Typical Trajectory of APS Implementations



after the solution has been in use for some time. What leads to each of these crises and what can you do to avoid or minimize their impact? Let's look at each crisis point in turn.

"The Solution Doesn't Work!"

Users meet the first valley of despair when expectations collide with reality. APS deployments are usually based on a compelling business case and backed by significant investments in software, hardware, and resources. It is typically the business users who identify the need and initiate the search for an APS solution, although it is not unheard of for an IT organization to lead the charge. Evaluation can take three months or more; licensing costs can run into several millions of dollars.

However, as the implementation transitions from the design phase into the first conference-room pilot, trouble strikes. When the solution is run for the first time with a production data set, the project team is likely to get an unwelcome surprise: seemingly unintelligible output, often accompanied by system performance problems. In one implementation we were involved with, the first few attempts at running the application with a full volume of data resulted in run times of over 24 hours—with no results to show for it.

The gap between anticipation and reality is large. Executives and everyday users alike have high expectations ("this will solve all our problems") that are often based on promises made by solution vendors. But in most cases, the vendor and systems integrator (SI) will be doing exactly what was asked of them. The problem lies with the interpretation of the results.

Discouraged, the project team struggles to determine whether the solution is functioning correctly—and then incorrectly concludes that it isn't. When this period of uncertainty lasts too long, the project runs the risk of losing priority or of being cancelled outright. Users continue with their legacy tools and processes, and the business fails to achieve any benefit from its sizeable investment up to this point.

In fact, in most cases, the solution does work exactly as it was designed to, but the APS output at this stage is difficult to interpret because of three factors: complexity of the underlying model, poor data quality and the team's lack of familiarity with the solution's algorithms and rules. Moreover, those factors tend to interact with each other, making it extremely difficult for the team to diagnose the root cause of any specific problem. Each factor merits a closer look.

1. Complexity of the Underlying Model. APS solutions belong to a broader class of applications often referred to as decision support systems. These differ from transactional systems, such as ERP, in several key aspects (see Exhibit 2).

One of the most important distinctions is that APS solutions model business reality through some level of abstraction and data aggregation instead of creating an exact representation. For example, when modeling a final test facility at a semiconductor plant, APS planning solutions often represent the capacity availability of a group of similar testers by using one representative tester's capacity as the proxy for total capacity of all the testers. This as opposed to modeling each individual tester and its available capacity. Translating a business problem into a model with the right level of abstraction is as much art as it is science: Too much abstraction and the results may be too far removed from reality to be of any use. Too little abstraction and the system may grind to a halt given the complexity and data volume required for the model.

The choice of the model must be appropriate for a company's particular operations strategy. Consider the examples of two companies with very different requirements for supply planning. The first, a consumer electronics company, had fully outsourced its manufacturing and had mature, trust-based collaborative relationships with its contract manufacturers. Although its chosen APS tool could model multiple levels in the supply chain in great detail, the company decided that all it needed was planning based on a single supply commitment from the final assembly level. This decision resulted in a simple and easily manageable planning model with relatively low data requirements that could be implemented quickly.

EXHIBIT 2

Decision Support and Transactional Systems Comparison

Decision Support Systems	Transactional Systems
Intended to help decision makers compile useful information from raw data, to identify and solve problems, and to make decisions.	Intended to store and record day-to-day business information, often structured around events, business processes, or business activities.
Designed for synthesis of solutions for specific business problems through use of transformations, and/or other analytical techniques on transactional data.	Designed for storing large volumes of data, but not for analyzing that data; often is the system of record for the data.
Internal data structures model real-world using some degree of abstraction.	Internal data structures directly map real-world with little or no abstraction.
Typically focused on the future, i.e., have a component to them	Focused on the present.
Typically enable business processes by providing inputs, and thus can support larger variations in the processes.	Typically define the business processes rigidly and completely.
Output is more complex and requires interpretation of the context of the underlying model.	Output is typically through reporting, and requires minimal interpretation; data used as inputs to decision support system.

In the second example, a fabless semiconductor company had a less collaborative supply chain and could not count on any one contract manufacturer to provide a complete picture of supply capability. The company also experienced frequent capacity and material constraints and had to manage material allocation between its contract manufacturers. This required the management team to gain visibility and control that extended deep into the supply chain. Consequently, the company decided to include all of its suppliers across multiple stages of manufacturing into its planning model. The resulting model was more complex, more data-intensive, and more sensitive to data quality than the model in our first example. For these reasons, it took longer to implement and required more effort to maintain. However, it gave the company's supply chain managers the requisite amount of control over their supply chain operations.

Both APS implementations were appropriate to their circumstances. Yet when designing the model for an APS solution, project teams tend to focus on meeting a long list of stakeholder functional requirements. They often lack the time to work through the nuances of alternate model designs and their implications. It is challenging enough to define a model that best supports the company's operational strategy. It is even more challenging to configure this model into the APS solution in a way that minimizes data requirements while maximizing output quality.

Not surprisingly, inexperienced teams tend to replicate legacy business practices in the new APS solution as well as add unnecessary complexity. They might, for example, insist on adding complex functionality to a demand planning application to publish a forecast at the weekly level—even though the entire demand planning process occurs at a quarterly or monthly level (because their current tool does so).

Successful deployments allocate sufficient time up front in order to consider the pros and cons of alternative models. The project teams carefully weigh the costs and benefits of adding complexity to their APS models. To that end, they often form a modeling team under the APS project umbrella to "own" the company's approach to solution deployment. In our experience, such a modeling team is most effective when it exists within the supply chain organization rather than IT. Moreover, the team should report to an executive who is senior enough for the team to be able to support multiple functional groups without conflicts of interest. The members of this team—including titles such as supply chain architect and master data manager—will typically report to a supply chain director or vice president. Often they are former planners. They understand the business requirements as well as the process of modeling these requirements in specific APS solutions, and they take an active role in driving the model design decisions.

2. Data Quality. APS solutions typically require some data elements that have not been used before or that are in a form different from the data being used by transactional systems. For example, the work in process (WIP) tracking system for a semiconductor manufacturer may track individual wafers in each lot at each step of the wafer fabrication and sort process, but a planning model may require a time-phased schedule of the total

quantity of good die expected to be received at the end of the sort operation from all the wafers currently in WIP.

Problems with data quality will compound any APS model configuration issues. Consider the case of a semiconductor company implementing a supply chain planning solution. The planning model represented the major stages of semiconductor manufacturing at an aggregate level and called for WIP to be represented at the end of each stage, with appropriate due dates. The company's manufacturing execution system (MES), the source of all WIP data, had been heavily customized over many years and contained many non-standard representations of product routing. For example, the same manufacturing step definition was used for representing an operation at both an internal and external facility. But that made it tough to determine which facility was under discussion without the use of additional information such as the part-naming convention.

When properly deployed, APS can improve supply chain operations significantly, as gauged by traditional measures such as inventory and customer delivery performance.

The IT team did not know all the customizations in the MES, so the initial data extracts grossly underestimated WIP and positioned the in-process inventory incorrectly in the planning model. This caused the planning tool to suggest significantly increased starts across all stages of manufacturing.

For users already struggling to understand the planning model, this only served to increase their distrust of the solution. It took many weeks of troubleshooting, plus development of extremely detailed mapping logic in the interface between the two systems, to minimize the errors. This led to delays in the overall implementation schedule. It took several more weeks after that to regain user confidence, and the effects of the experience still lingered well past go-live, adversely affecting user adoption. The APS system was being run in the production environment, but users remained wary and demanded proof that the outputs were correct for months after the go-live event. Inexperienced teams tend to grossly underestimate the effort required to identify and resolve data issues. They also delay tackling the problem until they are already deep in the first valley of despair, where they end up being overwhelmed by the magnitude of the problem.

Successful implementations recognize the importance of data quality as well as the need for a thorough understanding of the data usage within the model. To that end, these projects create a "data quality" team that works closely with the modeling team to identify and resolve data issues from the start. Successful teams also leverage the APS solution itself as a diagnostic tool to quickly identify data issues; some problems can only be detected by running the data through the model. Iterative cycles of model and data testing during development help to minimize the magnitude and duration of the first valley.

3. Lack of Familiarity with APS Algorithms and Rules. Many APS solutions use a variety of mathematical algorithms and solution techniques to solve complex supply chain problems. An early understanding of the underlying APS solution technique is critical. Without it, a company may make key design decisions about the model only to run into a host of problems later, such as inability to configure the design into the solution, serious system performance issues, and difficulty in interpreting results. As a result, many deployments waste precious time and resources redesigning the model or customizing the solution to fit the model.

Consider supply planning solutions. In very general terms, supply planning "engines" fall into two major categories: optimization-based and heuristics-based. Optimizers typically formulate the planning problem as a single holistic mathematical model, such as a linear programming model, to arrive at the optimal solution. Modeled correctly and at the right level of detail, these engines can produce high-quality solutions. However, the underlying models and solution techniques can be extremely sensitive to model complexity and data. They can encounter significant performance issues and may arrive at seemingly counter-intuitive solutions if not modeled with care.

Heuristics-based engines, on the other hand, typically solve the overall planning problem as a series of smaller problems using various business rules and simpler algorithms. The specific set of heuristics used in a given APS solution is usually proprietary to the vendor. The solutions arrived at by these engines, while not guaranteed to be optimal, tend to be feasible and more easily understood than an optimized solution. However, they often require a large number of parameters or business rules to be configured, and the quality of the solution may suffer if not configured with care. Business users must carefully consider the solution methodology when selecting an APS solution and when making model design decisions.

At the companies that manage to launch successful deployments, supply chain managers recognize the need for deep familiarity with the algorithms and solution approach of a given APS solution. They send members of their modeling team for extensive training on the solution before the design phase. This not only ensures that the right model design decisions get made but also provides the expertise to interpret the solution's output, thus minimizing the impact and duration of the first valley of despair.

"No One Is Using the Solution!"

The second valley of despair emerges when the solution moves into production. The new solution has gone live and is technically operational. Yet the business users—the supply or demand planners in the supply chain organization—find it difficult to interpret the output. Much like the implementation team earlier, they are confused by the planning model and the behavior of the APS solution. They are also unprepared to deal with the sheer volume of data presented in the solution. After some struggle, many tend to revert to the comfort of familiar

Delivering APS Value in Six Months

To support its strategic goal of becoming a leader in supply chain management, a large electronics equipment company initiated a massive transformation of its supply chain operations. Detailed assessment of its operations showed that the current operating model would not be capable of meeting the company's needs over the next five to seven years. Revenues were expected to double, and the company faced increased product complexity and the need to improve operational efficiencies in an increasingly competitive market.

Based on this assessment, the executive team developed guidelines for the operating model of the future and identified the key capabilities required to support that model. The critical capabilities included: real-time visibility into customer demand and inventory positions; ability to optimally balance supply and demand across the company's extensive network of contract manufacturers and suppliers; and improved ability to plan and respond rapidly to changing market conditions. The company chose an APS technology to enable these capabilities. The vendor provided tool-specific expertise for installation and configuration of the application while the company's own IT group managed the system integration.

Given its importance, the project has executive sponsorship from both the planning and IT organizations. The implementation team had co-leads from both business and IT. Team members were drawn from supply planners, IT resources, vendor resources and consultants. The team was challenged to deploy the APS solution and supporting processes within six months in order to drive the transformation of the company's operating model; this is two-thirds of the minimum implementation time typical. The project approach incorporated all the strategies described in this article.

First, specific individuals were chosen from the planning organization to form the modeling team. This team worked closely with the solution vendor to design the planning model and to configure it into the system.

Second, to maximize user adoption over the long term, all supply chain planners were included in the project implementation activities in various capacities. For example, planners were assigned specific data elements related to the products they were responsible for and led small "tiger teams" to identify and resolve data-quality issues. In addition to tackling data issues on an ongoing basis, the planners gained a deep understanding of the planning model and the data used.

Third, a small core team, derived from the modeling team, was established around the business solution to manage the continued evolution and enhancements to the planning model, processes, and business roadmap.

This approach helped the project team meet an aggressive six-month schedule set by the executive team. The solution was implemented and rolled out on time, including support for the users—the supply planners. The solution adoption process went smoothly compared to the typical APS project. Planners have not returned to old habits of planning on offline spreadsheets and processes. Instead, they are actively involved in defining enhancements to the model and in rolling out these enhancements in a phased manner.

Eleven months after the implementation, significant new business capabilities are now in place. For example, planners are able to respond quickly to demand upsides, allocate supply more rationally, and spend more time on what-if analyses to proactively identify and resolve issues. The complete and integrated supply and demand visibility allows planners to project a component shortage at a board-assembly site all the way to the end demand, thus allowing them to manage customer requirements and expectations significantly more effectively than before. The company is now well-placed to support much higher growth rates.

spreadsheets and abandon the solution altogether. Even deployments involving fewer users and smaller scope tend to suffer from the same user-adoption issues if the root causes are not addressed.

There are two reasons for this. First, the implementation team's performance is measured by near-term project deadlines rather than medium-to-long-term user adoption of the solution. And companies often are overly optimistic in their estimates of user adoption rates. It's typical for the implementation team, which has the best understanding of the solution at this point, to be disbanded shortly after the go-live, leaving the users with limited support and no place for questions.

Second: User training is often relegated to the software vendors that typically provide only off-the-shelf packaged training. Such training focuses on application navigation but not on the specific manner in which the solution was modeled to represent the company's business. Further, the training is typically provided by individuals not directly involved in the deployment and thus without an understanding of the design choices made or the reasons for them. Consequently, users are left without the requisite knowledge and skills to utilize the APS solution effectively.

Successful deployments recognize the need for comprehensive training of users. They extend the training well beyond the system basics and navigational skills to ensure that all users understand the underlying model design and its representation within the system. In our experience, a three-phase approach to training can be very effective for minimizing the second valley of despair:

- **Phase I:** Before the beginning of the design phase, members of the deployment team, especially those in the modeling and data quality teams, are given basic and advanced training on the APS solution by the vendor. This enables them to develop the model that meets the business requirements, leverages the solution's unique capabilities, and minimizes complexity to the extent possible.
- **Phase II:** Just prior to user testing of the solution, the user community is provided with training in basic tool navigation and usage by the vendor. This enables the users to conduct testing of key system modules and functionality.
- **Phase III:** In the weeks leading up to the go-live, the modeling team provides a comprehensive training session for the entire user community on the specific model implemented along with its inputs and usage. This prepares the users to make the best use of the new solution. The key here is that since the business objectives and operating structure vary from company to company, it is the modeling team and not the vendor that is best suited to deliver this training.

"The Business Has Changed!"

The last valley tends to develop as business conditions change, after solutions have been successfully implemented. That was the situation facing integrated device manufacturers in the semiconductor industry whose operational strategies shifted from captive manufacturing to outsourced fabless models. When their facilities were shuttered, existing planning practices became obsolete and the chip makers had to rapidly develop new planning models to communicate demand and supply with their external business partners. The models in their APS solutions had to be quickly updated to reflect the new operational reality.

All companies experience changes in their product structure, supply chain networks, constraints, business practices, and other operational variables over time. For example, the addition of new manufacturing sites or distribution centers typically requires new information such as sourcing rules, lead times, and parameters for APS solutions. However, business users don't always fully understand how such events affect the APS model and its output, and they fail to update their APS solutions in a timely manner. Consequently, the models begin to "drift" away from business reality while users attempt to fill the gaps with ad-hoc reports and spreadsheets.

Left unattended long enough, APS solutions cease to be relevant to the business and become mostly or completely supplanted by manual, spreadsheet-based processes. Soon, the existing solutions are declared ineffective and decommissioned. Shortly thereafter, spreadsheet-based processes are deemed inefficient and the entire APS deployment cycle begins anew—often with different solutions.

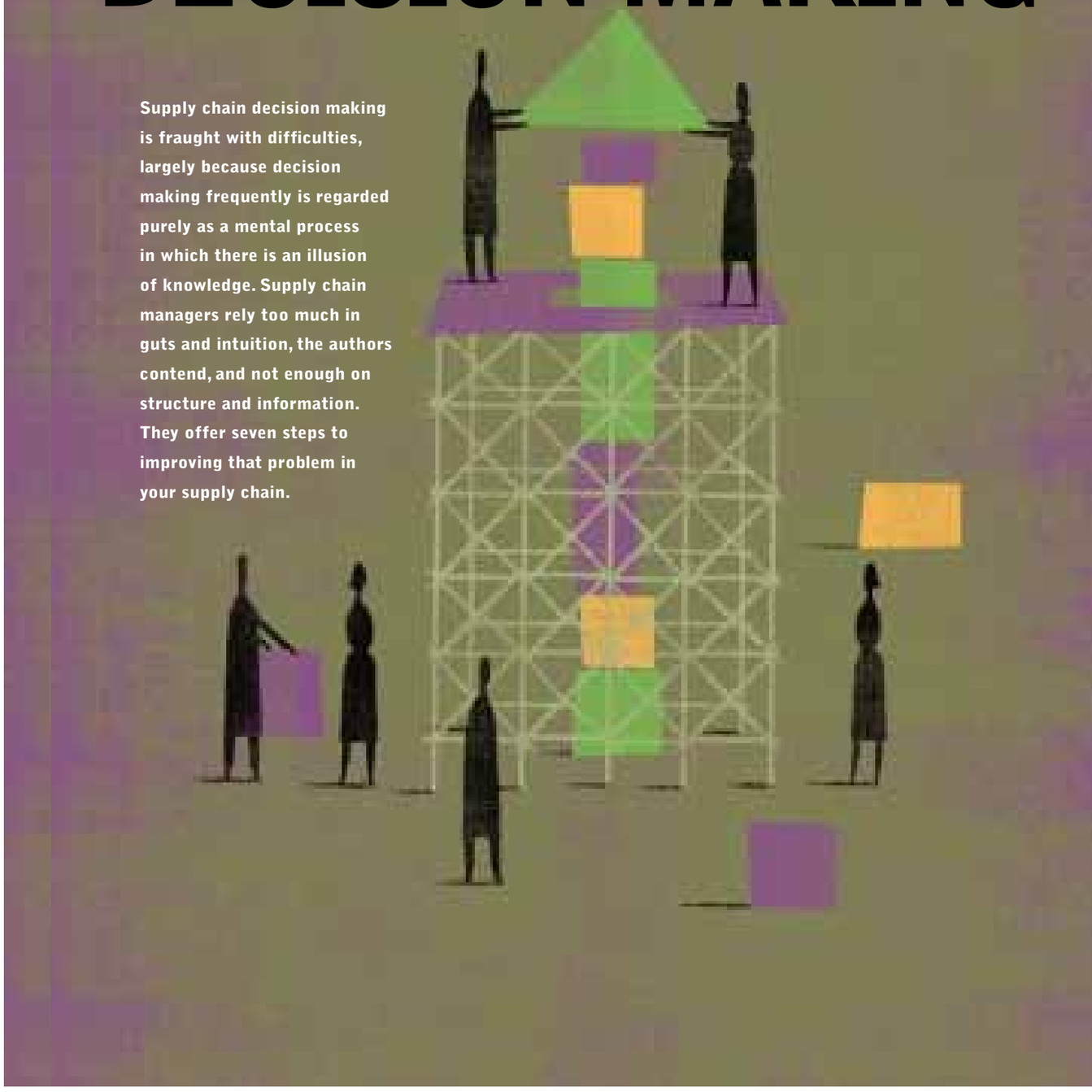
Successful deployments recognize the need to protect the heavy initial investments made by making continuous small investments to support the APS solutions over time. They do this by evolving the role of their modeling team to provide ongoing support, continuity, and a single point of ownership. As business circumstances change, the APS team works with the user community to update the APS solutions in order to keep them relevant to current business needs.

Granted, it may never be possible to completely eliminate all three valleys of despair when deploying APS solutions. However, by correctly diagnosing their current problems and anticipating the challenges ahead, companies can mitigate the impact of these predictable difficulties and steer their projects to success.

Putting the Structure in DECISION MAKING

By William B. Lee and Errol Wirasinghe

Supply chain decision making is fraught with difficulties, largely because decision making frequently is regarded purely as a mental process in which there is an illusion of knowledge. Supply chain managers rely too much in guts and intuition, the authors contend, and not enough on structure and information. They offer seven steps to improving that problem in your supply chain.



Many supply chain managers make the critical error of equating making decisions with solving problems. Decision making is not problem solving. Decision making is specific to the person. Problem solving is specific to the problem. Our work suggests that problem solvers are not necessarily the best decision-makers, and perhaps vice versa.

We have all heard jokes like, "to a surgeon, cutting can fix anything" or "to a chiropractor, manipulation can fix anything" or "to a psychologist, everything's mental." These jokes are, of course, not fair to those professionals, particularly the good ones. But don't we have the same sort of phenomenon with our supply chain decision making? Some will advocate that "lean can fix everything" or that "everyone needs to do Six Sigma." Again, we don't want to criticize the advocates of those techniques, just as we don't want to disparage surgeons or chiropractors or psychologists. It's just that we need to take a longer, more analytical look at our supply chain decisions and not simply jump in with the latest buzz word. We believe one of the reasons companies have so much trouble with their supply chains is a lack of a structured decision-making process.

Many surveys have shown that an overwhelming majority of professionals indicate that they rely on "common-sense and gut-feel" interpretation of data and subsequent decision making. They are inconsistent in how they approach decisions, and yet they frequently institute rules in an attempt to be more consistent. They also systematically distort certain pieces or types of information. The result of these decision-making approaches typically is that the same situation presented repetitively yields different decisions. Furthermore, these decisions rarely are anywhere close to being optimal.

This is pretty sad. Clearly, we are not going to do much to fix this situation with this one article, but maybe we can help. Many good books have been written on decision making; Two of the best are David C. Skinner's *Introduction to Decision Analysis*[1] and Errol Wirasinghe's *The Art of Making Decisions.*[2] Our objective is instead to highlight the role of decision-making processes, analysis, and models in supply chains.

Specifically, we offer seven steps to a more structured approach to supply chain decision-making:

1. Frame and describe the situation about which a decision is to be made.
2. Define the objective(s) of the decision and the criteria that define the objectives.
3. Extract obligatory criteria.
4. Creatively identify decision options that meet all obligatory criteria.
5. Gather information on decision alternatives, and develop the judgment table.
6. Assign weights to the obligatory criteria.
7. Rank alternatives.

To illustrate the use of such models, we like the old quote: "All models

William B. Lee (wbleephd@ymail.com) is a supply chain educator and consultant and co-author of the Leading Effective Supply Chain Transformation. *Errol Wirasinghe (errolw@xpertus.com) is a consultant on decision-making and author of* The Art of Making Decisions.

are wrong, some models are useful."

What are the implications of this quote—especially in this context of supply chain decision making? There are many, and we will explore some of them in the discussion that follows.

Complexity Drives Decision-Making

Readers of *SCMR* likely will agree that most supply chains are complex, particularly as they extend past suppliers to suppliers' suppliers, and past customers to customers' customers. Most companies also have multiple supply chains, which add additional complexity. In many industries, supply chain management perhaps is the single most important driver of the company's success and the single most difficult area of decision making.

Many surveys have shown that an overwhelming majority of professionals rely on "common-sense and gut-feel" interpretation of data and subsequent decision making.

Complexity drives uncertainty and risky environments for the decision maker. Uncertainty of demand and supply, uncertainty of the global business environment and many other uncertainties are prevalent. Risk of product failures, of customers or suppliers going out of business, of financial meltdowns—and many other risks also are widespread. Decision makers need to deal with all of these issues.

Importantly, please also recognize that relying on financial data alone can lead us to sub-optimal decisions. The message here is that we need a robust technique for handling multi-criteria decision making, and for validating decisions. A robust technique is one that is straightforward and that is difficult to misuse to get the wrong answer. The "guts and intuition" approach to decision making, by contrast, can easily lead a person or an organization astray.

The theory and practice of decision making (or "decision theory") classifies decisions as follows: decision making under certainty (DMUC), decision making under uncertainty (DMUU), and decision making under risk (DMUR). Decision theory contains well-known approaches to each.

When we know for certain the outcome associated with each decision alternative, it's called *decision making under certainty.* Some, but not many, supply chain decisions fall into this category—mostly short-term decisions. Of course, how certain is certain? No decision outcome is really certain, as we say, down to the 47th decimal place! Scheduling decisions, for example, sometimes might be considered relatively certain. When you place an order with Dell, they promise delivery of a computer in a certain number of days after your order, and it's there right on schedule with very little variation from one customer to another. Dell has made their mastery of the supply chain a real competitive advantage in the marketplace. FedEx is another example of a company that can promise delivery with some degree of certainty.

When a decision alternative can result in more than one possible outcome, along with an uncertain probability of occurrence, then we call it *decision making under uncertainty.* However, when we know the probability of each possible outcome, we call it *decision making under risk.* But, you argue, isn't our knowledge of the probabilities really just a guess and really a continuum? In most cases, that is true.

Consider a simple example. Say, we have a supply chain decision about a possible new supplier with two possible outcomes: "successful choice" or "unsuccessful choice". If we really do not know the true probabilities for either, we may choose to assign a 50/50 likelihood. But this really is a "perception-driven interpretation." Maybe it's 60/40 or 40/60. Or, maybe it's a normal distribution with a mean of 50 percent and a standard deviation of 10 percent? We have just turned DMUU into DUMR or, perhaps, into a continuum DMUR.

Case Study: Decisions Under Risk

In supply chain decision making, DMUR likely is the most prevalent condition. Let's look at a real case of a large lubricants company. We have disguised the case for use in our MBA and executive education teaching. Further, for this article we obviously have simplified the details of the case while nevertheless retaining the essence of the decision problem.

One of the company's specialty lubricants plants is experiencing a substantial increase in business. Feedstock supply is not an issue. The plant is an essential element of the company's supply chain as well as of its customers'. The company is considering three courses of action:

A. Subcontract for additional capacity
B. Construct new plant
C. Do nothing (no change)

Demand may be low, medium, or high with probabilities estimated to be 10 percent, 50 percent, and 40 percent respectively.

The company first is interested in the financial impact of the decision. It can estimate the net present value of profits from the three alternatives (A, B, and C) under the differing levels of demand. This is the "Payoff Matrix" shown in Exhibit 1. Several criteria can be used to make the decision regarding which of the three alternatives to choose.

EXHIBIT 1

Payoff Matrix

Demand	Low Demand	Medium Demand	High Demand
Probabilities of Demand	10%	50%	40%
Decision Alternatives	Net Percent Value of Profits from the Decision		
A. Subcontract of Additional Capacity	$10m	$50m	$90m
B. Construct New Plant	-$120m	$25m	"Maximax" $200m
C. Do Nothing (No Change)	"Maximin" $20m	$40m	$60m

The Maximin Criterion. Maximin is a criterion of extreme pessimism. It attempts to maximize the minimum possible gain. This is done by determining the smallest possible gain for each alternative if the worst possible event occurs. The alternative is selected that has the best outcome under the poorest conditions—the maximum of the minimums. Under this criterion, the best choice is C with a return of $20 million. The minimum for A is $10 million, and for B it is minus-$120 million.

The Maximax Criterion. This is the criterion of extreme optimism. Its objective is to select the decision alternative that will provide the maximum possible return, regardless of the associated probabilities. Under this criterion, the best choice is B with a maximum return of $200 million—the maximum of the maximums. The maximum for A is $90 million, and for C it is $60 million.

The Minimax Regret Criterion. "Regret" is synonymous with the opportunity cost of not having made the best decision for a given outcome. It follows that the decision maker would like to make a decision that minimizes regret. This is the "Regret Matrix" shown in Exhibit 2. Say, "high" demand occurs, and the payoff from decision A would have been $90 million, the payoff from decision B would have been $200 million, and the payoff from decision C would have been $60 million. The "regret" from A would have been $110 million ($200 million minus $90 million). This is the "minimax regret" (the minimum of the maximum regrets) choice.

EXHIBIT 2

"Regret" Matrix

Demand	Low Demand	Medium Demand	High Demand
Decision Alternatives	Net Present Value of "Regret" from Decisions		
A. Subcontract of Additional Capacity	$10m	$0m	"Minimax Regret" $110m
B. Construct New Plant	$140m	$25m	$0m
C. Do Nothing (No Change)	$20m	$10m	$140m

The Expected Value Criterion. This criterion weights the outcomes by their probability of occurring. For example, using the payoffs and probabilities cited above, the expected value for decision A is $62 million ($90 million x 0.4 + $50 million x 0.5 + $10 million x 0.1). This is shown in the "Expected Value" Matrix in Exhibit 3. The maximum expected value is $80.5 million, decision B.

EXHIBIT 3

"Expected Value" Matrix

	Expected Value
A. Subcontract of Additional Capacity	$62m
B. Construct New Plant	Maximum Expected Value = $80.5m
C. Do Nothing (No Change)	$46m

We often ask questions such as the following. "Given the information as presented, what would you do with the lubes plant decision and why? Especially since all three alternatives were chosen under different decision criteria." And what about the model? In what ways is the model an abstraction from reality, and what difference does it make? What additional information would you want if this were your decision?"

There are many ways we can make this model more complex and thus more "realistic." One example is sensitivity—we could test the sensitivity of the decision to the probability estimates, to the payoff estimates, and even to the decision alternatives themselves. Another example of additional complexity is with Alternative B: "What size of a new plant should we construct—small, medium, large, or very large?" Any number of additional complexities could be added to the decision.

So, what has this revealed? We have used this simplified (but realistic) example of a supply chain decision with three choices. By applying some very commonsense financial decision rules, all three choices have been shown to be reasonable under different decision criteria.

What's a supply chain manager to do? To try to put some light on this subject, let's look into some key supply chain decisions that need to be made and a structured approach for making them.

Key Supply Chain Decisions

It is useful to consider ways to classify supply chain decisions so that we can apply decision-making processes appropriately. One of the most effective classifications was presented by David Simchi-Levi and his co-authors in *Designing and Managing the Supply Chain*.[3] The following is adapted from that work:

1. *Strategic decisions* have a long-lasting (one to ten years typically) effect on the organization. These include target customers and their characteristics, product and service selection and design, distribution network configurations such as numbers and locations of facilities, structure and processes of the supply chain, supplier relationships, and so forth. Since these decisions are both long lasting and typically of great consequence, more time, effort, and formality usually are taken in the decision process. The lubricants plant above is an example of a strategic decision.

2. *Tactical decisions* include decisions that typically can be updated anywhere between quarterly and yearly. These likely include purchasing and supply contracts, production decisions, inventory policies, sales and operations planning, and so forth. These decisions are important but reversible in the intermediate time period. Thus, they would deserve some intermediate level of formality in the decision making process.

3. *Operational decisions* refer to day-to-day decisions such as scheduling, quotations, transportation, and so forth. These decisions typically last only a short period of time and are of little consequence if wrong. Thus, people likely will spend relatively little time or resources in making them individually. However, management frequently develops decision rules that apply to an entire class (say, quotations) of these decisions. For example, quotation decision rules may be something like "take the product standard cost and add a 40 percent markup for the price."

Structured decision processes, the focus of our discussion, usually deal with strategic and tactical decisions.

The Structured Approach

Many of us are accustomed to making decisions on the basis of quantitative data. The rate of return on a project, or the expected demand for a product, are easily explained in terms of numbers. In the above example, we developed a payoff matrix and applied financial criteria to the decision. But this is just one criterion. In the real world, there are many factors at play; these are what we refer to as "criteria."

The "guts and intuition" approach to decision making is easily confused and can easily lead a person or an organization astray.

Inherent in many supply chain decisions are factors such as company strategy, competition, customers, suppliers, bureaucracy, language barriers, governmental issues, and so forth—all of which are qualitative in nature. Thus the subjective human being (the decision maker) adds inevitable biases when he or she includes certain criteria, and excludes others.

To most people, a good decision is one that produces the desired outcome. Unfortunately this is a very limited definition. David Skinner makes a good point about outcomes and the relative desirability of possible outcomes.[1]

"Outcomes are what can happen. As an example, if you were going to have heart surgery, the outcomes could be:

- complete recovery, no side effects,
- partial recovery, some side effects, or
- death."

Clearly, we all would have our preferences about the outcome! So part of having a robust decision making process is a strong linkage of the decision(s)—say, not only whether to have heart surgery, but whom to choose as the surgeon, where to have the surgery, and the surgeon's decisions before, during, and after surgery—to the possible outcomes. We all know that different surgeons and different hospitals have different outcome probabilities. We want to weigh these in our decision process.

The quality of the decision will depend on a number of things: the decision alternatives, decision criteria, available data and information, context and domain of the decision, analysis techniques used, the expertise of the decision maker, and so forth. However, the outcome of the decision will, additionally, depend on appropriate timing, adequate resources, commitment to execution, and changing circumstances, among other factors.

As an alternative to gut-feel and pure common-sense techniques, we offer a seven-step process to making solid, structured decisions. We will discuss the steps in terms of the previous example. This approach is invaluable when we deal with qualitative information and criteria.

1. Frame and describe the situation about which a decision is to be made.

We paraphrase a famous anonymous quote: "A decision well framed is half made." The first step is to define the decision in light of the company's strategy, along with the decision's boundaries, interfaces, and influences. Strategic thinking drives decision making by:

- Setting strategic direction for the business.
- Establishing the objectives to deliver results.
- Creating measures to track progress toward objectives.
- Specifying behaviors that are required to implement the strategy.

Each of these is important as we frame our supply chain decisions.

2. Define the objective(s) of the decision and the criteria that define the objectives.

Objectives must be stated in unambiguous terms. Additionally, they should be time-bound, and progress must be measurable. In the earlier lubes plant example, we may have an objective stated as: "Determine the best option to meet the expected demand growth for the next five years." Wherever possible it is essential to have a statement (such as this one) that would allow us to measure progress in terms of achieving this objective. Thus, if the expected progress is not being achieved, we can take corrective measures in a timely manner.

Criteria explicitly define the objectives of the decision. As we structured the problem previously, the payoff matrix is just one criterion—financial. Most supply chain decisions (and most others for that matter) are multiple-criteria decisions—meaning that there are multiple objectives which the decision needs to achieve. The financial payoff matrix indicated no clear preferred option, but we would have needed to consider other criteria anyway. These could be, for example, the following four additional criteria.

- *Strategic fit.* How well do the candidate decision alternatives fit with the company's strategic direction? Does the company prefer outsourcing or not outsourcing? Does the company prefer to own excess capacity or to be tight on capacity?
- *Management capability.* Does the company have the necessary management capability to implement the options? If outsourcing is unfamiliar to the management team, this may be a difficult alternative to implement.
- *Risk.* Do the options present unacceptable risk to the company—defined in whatever way the company deems useful? For example, part of a robust decision process likely should be the possible environmental risk.
- *Customers' needs.* How well do the alternatives fit the needs of the customers?

3. Extract obligatory criteria.

With criteria, more is not merrier. As we add more criteria, the significance of the existing criteria is diluted. More than about 10 criterion require some sort of prioritization to extract the obligatory criteria simply because we may not be able to deal effectively with that many choices. The remaining criteria may be desirable or nice-to-have but not necessary. If there is a tie between the top two candidates, then we may revert to these desirable criteria to make a final decision.

The Analytic Hierarchy Process[4] (AHP) is a structured pair-wise comparison technique for dealing with complex decisions. Rather than prescribing a "correct" decision, the AHP helps the decision makers find the one that best suits their needs and their understanding of the problem. Several firms supply computer software to assist in using the process. AHP is beyond the scope of this article, but we wanted to introduce the idea and suggest that our readers go beyond the present discussion in this important area.

4. Creatively identify decision options that meet all obligatory criteria.

We have already identified the decision alternatives: sub-contract, build a new plant, or do nothing. Although we noted that each of these could be expanded into numerous sub-options such as build a small plant, or a medium-size one, or a large one, or on and on. We thus could build a hierarchy of decision options. Such a hierarchy can be analyzed using AHP. As to the "creative" approach, Errol Wirasinghe, in his book, says it well:

> "The role of creativity is that of generating and identifying options with which to solve a problem. … Creativity consists largely of rearranging what we know in order to find out what we do not know. A pile of rocks ceases to be a rock pile when someone contemplates it as a cathedral."[2]

5. Gather information on decision alternatives, and develop the judgment table.

This is where we note the pros and cons pertaining to the criteria, for each of our candidates. The quality of

our final decision will depend on how much effort we dedicate to the task. Do not skip this step; without adequate information about the candidates, we cannot make a reliable decision.

6. Assign weights to the obligatory criteria.
All criteria do not have the same significance. We may run an AHP evaluation to assign criteria weights. There is a danger in using common sense because you may become a victim of "hidden traps" in decision making as outlined in a 2006 *Harvard Business Review* article on the subject that we highly recommend.[5] The article mentions several types of traps, but postulates that what makes all of them so dangerous is their invisibility. Because they are hardwired into our thinking process, and thus our common sense, we fail to recognize them—even as we fall right into them.

We need to take a more analytical look at our supply chain decisions, not jump in with the latest buzz word.

7. Rank alternatives.
Ranking alternatives typically begins by discarding those that appear obviously inferior. In the lubes example, we intentionally did not include any inferior alternatives. Then, we run a pair-wise analysis on the decision alternatives using our judgment table. The decision maker systematically evaluates the various alternatives by comparing them to one another two at a time. That is, we compare subcontracting with building, subcontracting with doing nothing, and building with doing nothing. In making the comparisons, the decision makers can use concrete data, or they can use their judgments about the options' relative meaning and importance.

To validate the decision, we described the decision situation, decided which criteria are relevant;and assigned weights to these criteria to reflect their significance. At this point, we need to ask, Did our "human feelings" overly bias the decision in favor of some alternative? These may be some of the decision traps mentioned above.

Another very relevant validating question is: Will the winning candidate be valid if we were to remove any particular criterion? We then remove one criterion at a time and see its impact on the decision. Clearly, if we remove any single criterion, then we must re-evaluate the weightings of the remaining ones.

Next Steps

The reader should be aware of one caveat—we cannot possibly cover the subject of supply chain decision making in one short article such as this. Countless articles and books have been written on the subject of decision making alone, without adding the difficulties of supply chains. We thus have chosen to take a very narrow slice and not try to deal with such a complex subject in anything near a complete manner.

Our objective here has been to encourage the readers to consider how to structure decisions so as to improve their decision-making process. We have examined the dynamics of the decision process—the "how" and "why" of decision making—and have explained some elements of the structuring process. We also have shown how one approach (the financial one) easily can provide conflicting results and why most decision situations are multi-dimensional.

The example of the lubes plant shows a common structure of the financial role in the decision process—we can say (tongue firmly placed in cheek), "you tell me the answer you want, and I'll tell you what criterion to use!" We could expand this little statement to say that we also can manipulate the payoff matrix to give you the answer you want. But, that's not fair is it?

So, our message is to be careful about how you define the decision under consideration. We feel making use of the seven steps described here is the best way of helping to ensure a robust decision-making process.

End Notes

1 Skinner, David C., *Introduction to Decision Analysis: A Practitioner's Guide to Improving Decision Quality,* Second Edition, Probabilistic Publishing, 1999.

2 Wirasinghe, Errol, *The Art of Making Decisions: Expanding Common Sense & Experience,* Shanmar Publishing, 2003.

3 Simchi-Levi, David, Philip Kaminsky, and Edith Simchi-Levi, *Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies*. McGraw-Hill Irwin, 2008.

4 See Wikipedia article on "Analytic Hierarchy Process" for an introductory explanation and other references. (Accessed February 2010).

5 Hammond, John S., Ralph L. Keeney, and Howard Raiffa, "The Hidden Traps in Decision Making," *Harvard Business Review*, January 2006.